2020 CENSUS PROGRAM MEMORANDUM SERIES: 2021.22

Date: November 15, 2021

MEMORANDUM FOR: The Record

From: Albert E. Fontenot, Jr. **(Signed November 15, 2021)**
                        Associate Director, Decennial Census Programs

Subject: Documentation of Changes to the Count Review Operation

Contact: Sonia G. Collazo
                        Decennial Census Management Division
                        301-763-3350
                        Sonia.G.Collazo@Census.gov

This memorandum documents updates that have been made to the Count Review Operation (CRO) since the release of the 2020 Census Detailed Operational Plan (DOP) for the Count Review Operation on July 26, 2019. The operational changes are modifications or additions to the CRO activities and subactivities in the CRO DOP, which includes several updates that are related to the COVID-19 pandemic. The updates, summarized below, are provided to ensure accurate final documentation is available to the public. Sections and page numbers refer to the locations within the DOP.

- Operational Context Diagram (Figure 1), Page 9: Decennial Response File 1 (DRF-1) is added on the Inputs section box 19 (RPO) and Outputs section Finding's box (IE843) to reflect the review of this file. The DRF-1 was not initially part of the scope of CRO but was included in response to the COVID-19 pandemic.

- 2.3.2.3 CRO Operational Outputs (Table 3), Page 19: DRF-1 file is added to the Information Exchange for the Response Processing Operation (RPO). This file was not initially part of the scope of CRO but was included in response to the COVID-19 pandemic.

- CRO Operational Context Model (Figure 4), Page 34: The operational context model is updated to reflect the addition of the DRF-1 Review because of the COVID-19 pandemic. The changes are applied, as well, to Figure 5 (page 35), Figure 6 (page 37), Figure 11 (page 43), and Figure 25 (page 54).

- 3.2.2.2. Post-Enumeration Group Quarters Review, Page 42: The Post-

Enumeration Group Quarters Review was initially planned for June 15-19, 2020 (remote) and June 16-17, 2020 (on-site). This program was pushed to September 14-18, 2020, because enumeration operations were extended until September 2020 in response to the COVID-19 pandemic. This extension impacted the Review Event 2 schedule. A modified remote Review Event 2 was scheduled for September 23-28, 2020, and the on-site review was canceled because of COVID social distancing restrictions. The main changes for the modified review were that the participants used Excel files to review the group quarters for their state instead of the Group Quarters Processing Control System (GQPCS). In addition, only nonenumerated GQs that had an enumeration disposition reason of "**Cannot Locate in Block**" were provided to the state participants for their review. The opportunity to add new GQs and use of the Geographic Update Partnership Software (GUPS) as a reference tool were not provided to the participants because once the initial review was canceled, access to the census network was removed and couldn't be reinstated in time for the modified review.

- 3.3 Census Count and File Review (CCFR), Page 44: CCFR review was postponed to October 2020, and in response to the COVID-19 pandemic, a review of the DRF-1 file by subject matter experts was added to the scope of the operation. The review of the files was completed in June 2021.

The 2020 Census Memorandum Series

The 2020 Census Memorandum Series documents significant decisions, actions, and accomplishments of the 2020 Census Program for the purpose of informing stakeholders, coordinating interdivisional efforts, and documenting important historical changes.

A memorandum generally will be added to this series for any decision or documentation that meets the following criteria:

1. A major program-level decision that will affect the overall design or have significant effect on 2020 Census operations or systems.

2. A major policy decision or change that will affect the overall design or significantly impact 2020 Census operations or systems.

3. A report that documents the research and testing for 2020 Census operations or systems.

Visit 2020 Census on Census.gov to access the Memorandum Series, the 2020 Census Operational Plan, and other information about preparations for the 2020 Census.

2020 Census Detailed Operational Plan for:
23. Count Review Operation (CRO)

A New Design for the 21st Century

Issued: July 26, 2019
Version: 1.0
Prepared by: Decennial Census Management Division

United States™ Census Bureau

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Approvals

This CRO Detailed Operational Plan has been reviewed and approved for use.

Electronically Approved	June 20, 2019
Sonia G. Collazo	Date Signed
IPT Lead/Branch Chief	

Electronically Approved	June 21, 2019
Judy Belton	Date Signed
IPT Program Manager	

Electronically Approved (Suzanne Fratino)	August 1, 2019
Deborah M. Stempowski	Date Signed
Chief, Decennial Census Management Division	

Document Change History

Revision #	Version	Date	Description
1	v0.01	11/30/2018	• Initial Working DRAFT Version from 2020 Census DOP template. • Uses annotated version of CRO BPM version v0.34b.
2	v.001a	2/27/2019	• CRO Initial working version.
3	v.001b	3/28/2019	• POP provided content for CCFR.
4	v.001c	4/08/2018	• CRO incorporate POP comments
5	v.001d	5/20/2018	• POP provided additional content. • CRO incorporated POP comments.
6	V0.01e	6/10/2019	• CRO Incorporated MITRE comments.
7	v.0.01f	6/24/2019	• CRO incorporated ADC comments.
8	V1.0	8/5/2019	• Uses annotated version of CRO BPM version v1.2, dated 5/23/19.

Note: The fields below update the document version, date, and status in the page footers throughout the document.

Document Footer Information Control Table

Field Name	Version, Date and Status
DocVersion:	Version 1.0
DocDate:	August 5, 2019
DocStatus:	Final

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1. Document Purpose

The 2020 Census Detailed Operational Plan for the Count Review Operation (CRO) is intended for use by U.S. Census Bureau managers, staff, contractors, and other internal and external stakeholders working on the 2020 Census. The document presents the detailed operational design for the 2020 Census CRO and includes a summary of the operational processes involved, their inputs, outputs, controls, and the basic mechanisms employed to conduct the operational work.

Anticipated uses of this document include the following:

- Communication—Documents operational design details for internal and external stakeholders.

- Planning—Documents planning assumptions and key milestones.

- Staffing—Documents staffing needs and strategies.

- Design—Describes operations and flows, which inform design of IT systems, manual processes, and training.

- Development—Identifies business rules and required capabilities to be developed.

- Testing—Provides a basis for developing integrated test plans for IT systems and processes.

This document complements the 2020 Census Operational Plan, which presents the 2020 Census operational design and covers all operations required to execute the 2020 Census, starting with precensus address and geographic feature updates and ending once census data products are disseminated and coverage and quality are measured.

2. Operational Overview

2.1   Operation Purpose

The 2020 Census Count Review Operation (CRO) enhances the accuracy of the 2020 Census through:

- Implementing an efficient and equitable process to identify and incorporate housing units (HUs) that are missing from the Census Master Address File (MAF).
- Identifying and including or correcting large group quarters (GQs), such as college/university student housing, that are missing from the MAF or geographically misallocated.
- Positioning unresolved cases for a smooth transition to the Count Question Resolution operation.
- Evaluating census responses and subsequent data files at multiple levels of geography for reasonableness and verifying that edits have been properly applied.

2.2   Background

Since Census 2000, the Census Bureau has relied on its partnership with the Federal-State Cooperative for Population Estimates (FSCPE) to ensure a successful Count Review. The Census Bureau's FSCPE program, established in 1967, is one of the three main Census Bureau partnerships groups. State FSCPE organizations or agencies, designated by their respective governors, work in cooperation with the Census Bureau's Population Division (POP) to produce population estimates.

2.2.1   2010 Census Count Review activities

Count Review activities for the 2010 Census consisted of (1) the Count Review Program (FSCPE Count Review), and (2) Traditional Count Review. These two activities were managed separately, but often shared staff.

2010 Census Count Review incorporated a variety of lessons learned from Census 2000, including planning Count Review early, integrating Count Review with other Census Bureau operational units, developing guidelines for documentation needed to investigate issues identified during Count Review, and prioritizing review cases. These lessons learned have carried forward to 2020 Census planning.

2.2.1.1   Count Review Program (FSCPE Review)

The goal of FSCPE participation in Count Review is to ensure local knowledge is incorporated into the review of the decennial census address frame and the results. Within their states, FSCPE participants are experts on population issues and knowledgeable of their unique circumstances. These perspectives are critical to a successful Count Review and provide important perspectives that may otherwise be overlooked. Participating state members were contracted by the Census Bureau to take part in Count Review and granted Special Sworn Status to view confidential census records.

In preparation for the 2010 Census, a limited-scope Count Review was applied to the counts from the 2008 Census Dress Rehearsal. During this test, and to complement Traditional Count Review, a new approach based on geospatial data and geographic information systems (GIS) was applied that proved very effective in identifying the exact addresses of missing living quarters (housing units and group quarters). This approach was therefore adopted for the 2010 Census as an integral part of FSCPE Count Review.

FSCPE Count Review in 2010 occurred during two events at Census Bureau headquarters, each lasting one week and timed to coincide with other 2010 Census operations:

- **Housing unit review (February 2010):** Pre-enumeration review of missing clusters of 30 or more housing units. For this event, 32 states or equivalents participated.
- **Group quarters review (August 2010):** Post-enumeration review of missing or misallocated group quarters. For this event, 43 states or equivalents participated.

During review, participants were provided computers and analytical case creation tools to compare state-submitted address data against an Enumeration Universe extract of the MAF. These tools included tables to identify geographies where the counts of state-supplied addresses were higher than the Census Bureau counts. These tools also had the ability to navigate from tables to maps displaying the relative locations of state and Census Bureau addresses to find eligible GQs or HU clusters to submit as cases. Backup processes were also developed in case the primary software tools malfunctioned or otherwise did not meet the needs of these review events.

Eligible GQs included nursing/skilled nursing facilities, college/university student housing, military quarters, adult correctional facilities, and workers' living quarters and job corps centers with populations of 50 or more. These GQ types were selected for the review since they represented more than 80 percent of the nation's GQ population and were the majority of large GQs. In total, 89,616 eligible GQ records were loaded into the evaluation software.

Cases submitted by state participants were escalated to a Census Bureau staff liaison for approval before sending to other operations for processing. For HU review, approved count issues were enumerated during the vacant/delete field operation. For GQ review, approved count issues resulted in field representatives from regional census centers contacting missing GQs using a calling script to obtain the population as of Census Day (April 1, 2010).

The 2010 Count Review Program did improve the accuracy of the census by identifying 73,716 missing HUs and having them counted in the census. It also identified 310 missing GQs and had them counted in the census. Additionally, 173 GQs misallocated to the wrong collection block were identified and updated.

A variety of recommendations were provided after the 2010 Census Count Review, including: plan early and incorporate Count Review into the census program life cycle; expand the use of geospatial data to inform count review, including use of address-level data and latitude/longitude coordinates for living quarters; and broaden awareness within FSCPE of address data sources, including E911 and parcels.

2.2.1.2   Traditional Count Review

Traditional Count Review (TCR) attempted to identify potential data anomalies in the aggregated total population, GQ, and HU counts that could be because of data procedure issues during the final stages of data processing. If anomalies were identified, 2010 Census operations could review their processing steps to determine if there were issues that were correctable.

Anomalies or outliers in the census count compared to the benchmark estimates could be because of several factors, such as enumeration error, processing error, demographic changes, geographic changes, and/or inaccurate benchmarks used for comparison (e.g., population estimates projected forward from the previous census).

To accomplish TCR, Census Bureau staff developed processes for a systematic review of each of the five major 2010 Census data files, below. Dates the reviews occurred are included as well.

1. **Follow-up Enumeration Universe Control File (FEUC; August 2010):** Early census results prior to completion of field operations. The review of this file was limited, considering its preliminary nature.
2. **Decennial Response File (DRF; October 2010):** Results of enumeration activities after one return has been selected for each household but before final housing and population counts have been calculated.
3. **Census Unedited File (CUF; November 2010):** Results with final housing and population counts after count imputation procedures applied. These were the final counts for the

2010 Census and were used to calculate apportionment of the U.S. House of Representatives.

4. **Census Edited File (CEF; December 2010 to February 2011):** Results of the demographic edits applied to the CUF. Also, this file was converted from collection geography to tabulation geography.

5. **Hundred Percent Detailed File (HDF; December 2010 to February 2011):** Results with all count imputation and editing procedures applied to the CEF. Contains the final counts for the 2010 Census for counties, places, and tabulation tracts and blocks. Used to generate detailed published benchmark for the next decade.

To support TCR, an internal review tool was developed to identify anomalies in each of the data files using a variety of metrics comparing the file's data values to existing benchmark data. These benchmarks included 1) county-level population estimates produced by the Census Bureau's Population Estimates Program; 2) tract-level population, housing, and vacant counts/distributions produced by a third party; and 3) Census 2000 counts of population, housing, household population, persons per household, and GQ population by GQ type. For each geography considered, statistics analyzed included numeric difference, percent difference, and loss functions. The review of each file was conducted on a state-by-state flow basis.

Planning for TCR began in the winter of 2007. TCR was incorporated into 2010 Census planning as part of the Master Activity Schedule (MAS), including key deliverables and milestones. The TCR work structure and activity schedule were designed to complement the MAS.

Recommendations from the 2010 Census TCR centered around incorporating a visual element to the review, especially in the form of a mapping component, and formalizing collaboration among various operational units within the Census Bureau.

2.2.2   2020 Census Count Review Operation

The 2020 Count Review Operation (CRO) will use a similar overall approach as in 2010. Additionally, based on lessons learned from previous Count Review activities, CRO has implemented numerous operational innovations:

- The separate FSCPE CR and components of TCR programs were combined into the single Count Review Operation. Additionally, TCR has been renamed to Census Count and File Review (CCFR). Combining and elevating these programs to an operation acknowledges their integral role in the 2020 Census.
- Planning for the CRO began earlier than for previous censuses and involved buy-in from key Census Bureau stakeholders within Decennial Census Programs (operations expertise) and Demographic Programs (subject-matter expertise).

- CRO will also be timed such that the results of the reviews are fully integrated with other 2020 Census operations. For example, the review of HUs will be conducted in time to include any changes resulting from the review into the supplemental universe for potential mailings and for Nonresponse Followup (NRFU). It will also allow time to follow up or to conduct data collection at misallocated or missed GQs.
- The 2010 Census TCR and FSCPE Count Review activities recommended enhanced adoption of analytical software tools for evaluating the results of the census. CRO has therefore invested in tools that both display data and include visual elements such as maps and charts to enhance staff analytical capabilities.
- Previous FSCPE Count Review activities were held on-site at Census Bureau headquarters. However, to provide greater flexibility, a remote review option using secure Census Bureau Virtual Desktop Infrastructure (VDI) has been added as an option for state participants. Because of the lower cost of implementing VDI, state participants who elect to review data remotely will also have a longer time period to conduct their reviews.
- Greater use of geospatial data is being adopted for 2020 CRO. FSCPE participants are being provided structured processes, guidance, and templates to provide address data for matching with Census Bureau data in the MAF well in advance of the review events.
- State participation in FSCPE Count Review has increased substantially leading up to the 2020 Census, thanks to enhanced outreach and communication by Census Bureau staff and support from the FSCPE community. Additionally, several FSCPE participants in 2010 Census Count Review were onboarded as early participants to test software and workflows prior to the review events in 2020, and to communicate lessons learned to the Census Bureau and the rest of the FSCPE community.

The FSCPE Review is similar to another 2020 Census operation, Local Update of Census Addresses (LUCA). However, Count Review serves a different purpose: whereas LUCA occurs earlier in the decade and is used to develop the address frame prior to address canvassing, Count Review is conducted after address canvassing to assist in identifying housing units or group quarters that have been missed, or group quarters that are misallocated. LUCA is open to tribal, state, and local governments, but Count Review is designed to facilitate only the participation of members of the FSCPE. More information about LUCA and its components, including the New Construction (NC) Program, can be found in its detailed operational plan. Some limited additional detail is also available in Section 2.4.1 of this document.

CRO participated in the 2018 End-to-End Census Test. The focus of CRO during this exercise was evaluating the reasonableness of select measures derived from the CEF, while other activities related to CRO were considered out-of-scope. This exercise was used to make preliminary

determinations about the sufficiency of certain data review, management, and communication plans for 2020 activities.

2.3   Design Overview

The sections below present the high-level design for the Count Review operation (CRO). Please refer to the 2020 Census Operational Plan for a complete inventory of design decisions for all 2020 Census operations.

2.3.1   High-Level Operational Design

The design of the CRO operation for the 2020 Census includes four major operational activity areas:

- **CRO Planning and Preparation.**
- **FSCPE Review.**
- **CCFR.**
- **CRO Closeout.**

Each of these major activity areas is summarized below. Together, these activities represent the complete set of work that needs to be performed to conduct this operation.

CRO Planning and Preparation

CRO has been fully integrated with other 2020 Census operations. This integration will permit the findings from CRO to flow into subsequent census operations. State-of-the-art software will allow for address-level precision in identifying missing HUs and GQs—with supporting evidence—for enumeration in the 2020 Census. Advance communication with FSCPE participants and their organizations or agencies, accompanied by training opportunities, will position participants to begin gathering quality address lists and optimize their time during the review events. Software tools have been developed for both FSCPE Review and CCFR to enhance both Census Bureau staff and FSCPE participant analytical capabilities for identifying potential review cases.

FSCPE Review

The participants in this activity are members of the FSCPE, one of the three main Census partnerships groups. State FSCPE organizations or agencies, designated by their respective governors, work in cooperation with the Population Division (POP) at the Census Bureau to produce population estimates. The states have the opportunity to provide address data for HUs and/or GQs for matching and comparison with the Census Bureau's MAF to identify missing

HUs and missing or misallocated GQs. The identified HUs and GQs will be added to the NRFU and GQE workload.

CCFR

The objective of the CCFR is to determine how reasonable the results of 2020 Census data collection efforts appear to be at several levels of geography compared to multiple sets of benchmark data. If CCFR finds anomalies or unexpected results, those findings will be reported to the Response Processing Operation to review processing steps to determine if the issues are correctable. CCFR also includes the edit review process that verifies each person and HU in the CEF have valid values and ensures consistencies among characteristics. Edit review focuses on path tracers (tallies) and hot deck matrix reports and verifies that the edit and imputation processes have been applied correctly.

CRO Closeout

All submitted cases for FSCPE Review and CCFR will be reviewed, and qualified issues will be forwarded to the appropriate Census Bureau operational units to be included in existing processes. For the FSCPE Review, this consists of forwarding approved address cases to NRFU, GQE, late GQE, or CQR so the addresses and any associated population may be reflected in the census count. For CCFR, qualified issues are adjudicated, and the results are factored into any determination to reprocess the corresponding files.

The full hierarchy of activities for the CRO operation is provided in Appendix C in the form of an Activity Tree. In the Activity Tree, each major operational activity area listed above is numbered and then decomposed into a numbered set of subactivities, some of which are further decomposed into more detailed numbered subactivities or steps.

For a full description of the operational subactivities that comprise the CRO operation, see the Detailed Process Description discussions in Section 3 below.

2.3.2   CRO Operational Context

The CRO operational activities described above are conducted within the context of other 2020 Census operations and other programs or data sources that are external to the 2020 Census Program. One way to depict an operational context is by using a "Context Diagram," which shows the boundary of the operational process, the operational activities it contains, and the information exchanged with its neighbor operations (or other entities) as well as the resources (mechanisms) needed to conduct the operational work.

Figure 1 below is a top-level context diagram for the CRO operation represented as an Integrated Definition, Level 0 (IDEF0) model. An IDEF0 model of a process (or operation) shows the Inputs, Controls, Outputs, and Mechanisms of the process. These IDEF0 model elements are summarized below and described further in the sections that follow.

The yellow box in the center of the IDEF0 model lists the major operational activity areas for the operation, numbered as given in the CRO Activity Tree in Appendix C. Specific Information Exchanges (IE) are shown in different colored boxes to represent the Inputs (green boxes on left side), Outputs (orange boxes on right side), Controls (purple boxes on top), and Mechanisms (blue boxes on the bottom). Boxes to the left of the Inputs indicate the *Provider* of the inputs to the operation (typically another 2020 Census operation or an external source). The Provider of the Controls is noted in the box itself. Boxes to the right of the Outputs indicate the *Receiver* of the outputs (typically another 2020 Census operation or external entity). Each Information Exchange has a name and a unique number for identification purposes.
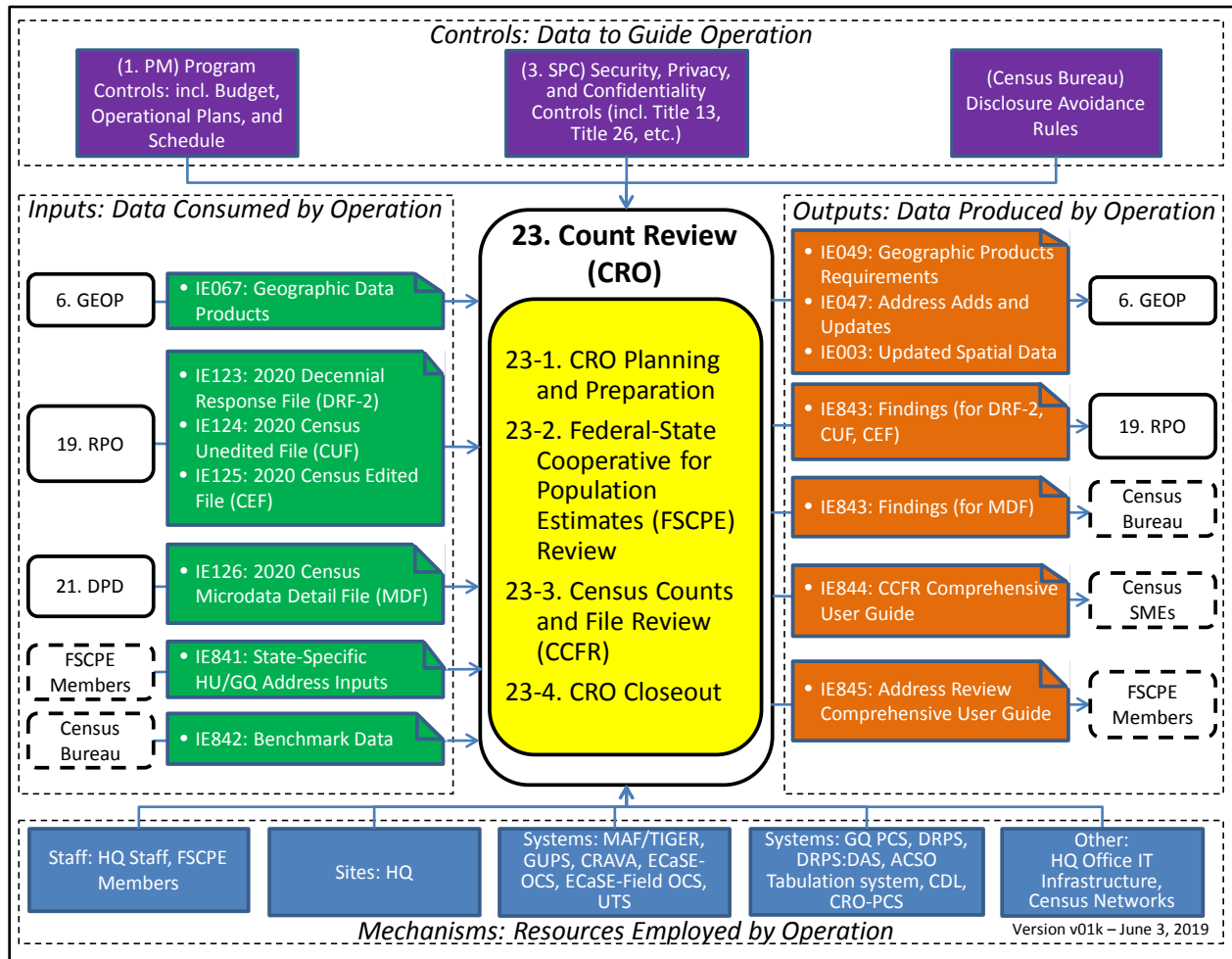
Figure 1: Count Review (CRO) Context Diagram

For detailed descriptions of the Inputs, Controls, Outputs, and Mechanisms used by the CRO operation, see the sections that follow.

2.3.2.1   CRO Operational Inputs

Inputs are the data that are consumed by the operation. The inputs define the amount of operational work that needs to be performed.

Table 1 lists the inputs to the CRO operation.

Table 1: CRO Operational Inputs

Provider	Information Exchange	Description
6. Geographic Programs operation (GEOP)	IE067: Geographic Data Products	The geographic products that will be needed to conduct the specific 2020 Census operations work. Includes shapefiles and address files for HU and GQ.
19. Response Processing Operation (RPO)	IE123: 2020 Decennial Response File (DRF-2)	The computer file containing all 2020 Census responses for the final enumeration universe after additional data processing, GQ matching and unduplication, and application of Primary Selection Algorithm (PSA).
19. Response Processing Operation (RPO)	IE124: 2020 Census Unedited File (CUF)	All person and household records for the 50 states, D.C., and Puerto Rico, including group quarters (GQ) records with person records for the 2020 Census. The CUF is the baseline file for the total count of people and the total count of housing units. The final frame for GQ records is also included.

Provider	Information Exchange	Description
19. Response Processing Operation (RPO)	IE125: 2020 Census Edited File (CEF)	All person and household records for the 50 States, D.C., and Puerto Rico, including GQ records with person records for the 2020 Census. The CEF is the results file for the consistency edits, imputation, and allocation of characteristics for all people (in housing units and GQs) and housing unit characteristics.
21. Data Products and Dissemination operation (DPD)	IE126: 2020 Census Microdata Detail File (MDF)	The input files for tabulation (50 states, D.C., and Puerto Rico), which have been processed through consistency edits and disclosure avoidance modeling to protect privacy and confidentiality.
Federal-State Cooperative for Population Estimates (FSCPE) Members	IE841: State-Specific HU/GQ Address Inputs	FSCPE agencies for each state, designated by their respective governors, work in cooperation with the Census Bureau's Population Division to produce population estimates. By using specially developed geographic-based software, FSCPE representatives can make comparisons with their own data sources to identify potentially missing housing units and missing or misallocated group quarters at key points during census operations.
Census Bureau	IE842: Benchmark Data	Benchmark data files for CCFR are those that will be used to generate comparisons with the 2020 Census results for the purpose of identifying, evaluating, and reporting results that are outside of reasonable parameters. The specific files that will be used for the 2020 CCFR are Census 2000, the 2010 Census, the Vintage 2018 Population Estimates, and the 2014-2018 American Community Survey 5-year estimates.

2.3.2.2   CRO Operational Controls

Controls are the data that guide the behavior of the operation. They are not consumed by the operation, but rather they provide guidance, models, limits, criteria, cutoff dates, or other information that controls the way in which the operational work is performed.

Table 2 lists the controls for the CRO operation.

Table 2: CRO Operational Controls

Provider	Information Exchange	Description
1. Program Management operation (PM)	Program Controls	Program Control information including: • Budget. • Operational plans and schedule.
3. Security, Privacy, and Confidentiality operation (SPC)	Security, Privacy, and Confidentiality Controls	Laws, policies, regulations, and guidelines related to physical security, IT security, data security, and privacy and confidentiality impacts, analyses, and processes. These include but are not limited to Title 13, Title 26, and other laws and policies related to protection of personally identifiable information.
Census Bureau	Disclosure Avoidance Rules	Techniques applied prior to publicly releasing data products to protect the confidentiality of Census respondents and their data.

2.3.2.3   CRO Operational Outputs

Outputs are the data produced by the operation. The outputs constitute the results of operational work that has been performed. Outputs produced may be used as inputs or controls to other operations.

Table 3 lists the outputs from the CRO operation.

Table 3: CRO Operational Outputs

Consumer	Information Exchange	Description
6. Geographic Programs operation (GEOP)	IE049: Geographic Products Requirements	Requirements for the Geographic products that will be needed to conduct CRO.
6. Geographic Programs operation (GEOP)	IE047: Address Adds and Updates	Address adds and updates for the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) system identified during the field data collection operations.
6. Geographic Programs operation (GEOP)	IE003: Updated Spatial Data	Address and spatial data from MAF/TIGER.
19. Response Processing Operation (RPO)	IE843: Findings (for DRF-2, CUF, CEF)	Receives and manages updates to the initial 2020 Census universe.
Census Bureau	IE843: Findings (for MDF)	Review of final counts after application of demographic data tabulation recodes and disclosure avoidance procedures to ensure that data appear reasonable at multiple levels of geography. This review ensures that issues identified in the DRF-2, CUF, and CEF reviews have been addressed.
Census Subject Matter Experts (SMEs)	IE844: CCFR Comprehensive User Guide	Determination of how reasonable the results of decennial census data collection efforts appear to be at several levels of geography compared to multiple sets of benchmark data. Includes edit review, the process that verifies that each person and housing unit in the CEF have valid values and ensures consistencies among characteristics.

Consumer	Information Exchange	Description
Federal-State Cooperative for Population Estimates (FSCPE) Members	IE845: Address Review Comprehensive User Guide	FSCPE agencies for each state, designated by their respective governors, work in cooperation with the Census Bureau's Population Division to produce population estimates. CRO and the Geography Division (GEO) will develop a document that will provide guidance to the participants on how to perform an effective review of the address data for their state.

2.3.2.4 CRO Operational Mechanisms

Mechanisms are the resources (people, places, and things) that are used to perform the operational processes. They include Staff Resources, Infrastructure Sites, Systems, and other Technology Infrastructure.

Staff Resources

Table 4 identifies the Staff Resources employed for the CRO operation.

Table 4: Staff Resources Used Within CRO Operational Activities

Staff Resources	Description/Role
Headquarters (HQ) Staff	Census Bureau HQ staff to perform the CRO operation. Of note for the CRO operation, HQ Staff includes staff from POP, the Social, Economic, and Housing Statistics Division, GEO, and the Center for Enterprise Dissemination – Disclosure Avoidance.
Federal-State Cooperative for Population Estimates (FSCPE) Members	FSCPE members from each state serve as contract Census Bureau employees to review in-scope HU and GQ addresses prior to the census. They will also have the opportunity to review the enumeration status of in-scope GQs for their states following GQE.

Infrastructure Sites

Table 5 identifies the Infrastructure Sites employed for the CRO operation.

Table 5: Infrastructure Sites for CRO Operational Activities

Infrastructure Site	Description/Role
Headquarters (HQ)	HQ sites to support the management of the CRO operation.

Systems and other Technology Infrastructure

Table 6 identifies the Systems employed for the CRO operation.

Table 6: Systems Used Within CRO Operational Activities

System	Description
Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) system	A Census Bureau system that provides address and spatial data products for participants and a mechanism for applying updates made by participants. MAF/TIGER includes a number of component systems and utilities that are used for CRO.
Geographic Update Partnership Software (GUPS)	Geospatial software package provided to CRO participants. GUPS is a QGIS plugin that presents CRO participants the opportunity to compare their state addresses to the MAF through a GIS interface and summary tables.
Census Review, Analysis, and Visualization Application (CRAVA)	CRAVA will be used during CCFR. This software will read in 2020 Census data and benchmark data and will, through tables and visualizations, permit Census Bureau analysts to identify, evaluate, and report 2020 Census data that are outside of reasonable parameters.
Enterprise Censuses and Surveys Enabling-Operational Control System (ECaSE-OCS)	Enterprise solution supporting the entire decennial census process, including workload assignment and schedule management.

System	Description
Enterprise Censuses and Surveys Enabling- Field Operational Control System (ECaSE-Field OCS)	Enterprise solution supporting the entire decennial census process, including workload assignment, schedule management, and workload management (e.g. check out, check in, linking, and shipping of cases, selection of reinterview cases, etc.).
Unified Tracking System (UTS)	The UTS provides reports made available to management.
Production Control System for Count Review (CRO-PCS)	An interface/tracking system that will be leveraged to communicate progress across the FSCPE participants, Count Review Team, and GEO.
Production Control System from GQ (GQPCS)	Application system supporting the Group Quarters Advance Contact. Provides census staff, clerks, and other field staff the opportunity to review and edit records in the GQ Universe and use this information to contact the administrator of each GQ within the area of responsibility to confirm information about the GQ, build a GQ profile, and schedule an enumeration visit.
Decennial Response Processing System (DRPS)	DRPS performs: • Auto/Residual coding (the process of changing write-in responses to coded entries). • The creation of the Decennial Response File (DRF). • The application of the Post Capture Data Integration to the DRF to create the DRF-1. • The application of the Primary Selection Algorithm (PSA) to the DRF-1 to create the DRF-2. • The application of Preliminary Census Unedited File (PCUF) processing and count imputation to create the Census Unedited File (CUF). • The application of the use of edits and characteristic imputation to create the Census Edited File (CEF).

System	Description
Decennial Response Processing System (DRPS): Disclosure Avoidance System (DAS)	DAS applies privacy controls to microdata in the data flow from the CEF to the MDF. These privacy controls prevent direct mapping between individual records in the CEF and individual records in the MDF.
ACSO Tabulation System	The ACS-Decennial Tabulation System is an overarching system that includes subsystems, which create tabulation table dictionaries, tabulated data products, and metadata and data files for the dissemination systems. The table generator creates data products in a tabular format and includes aggregated counts, ratios, percentages, and medians.
Census Data Lake (CDL)	The Census Data Lake serves as the repository for paradata and response data. It is built on a distributed, scalable platform to support data ingest and storage and to provide data access to reporting and analytics applications.

Other technology infrastructure employed for the CRO operation includes:

- HQ Office Information Technology (IT) Infrastructure.
- Census Networks.

2.4 CRO Data Flow and Operational Influences

The Count Review Operation (CRO) participates significantly during Frame Development and again during Data Collection as data are prepared for publication. The interactions and data are described in the following subsections.

2.4.1 CRO Data Flow and Operational Influences During Frame Development

Figure 2 below is an Integrated Operations Diagram (IOD), which depicts the major interactions among the operations and external entities involved in the development of the 2020 Census

Frame (address and spatial data). This diagram shows the Geographic Programs operation (GEOP) as the hub of frame development and GEOP's interactions with the other 2020 Census operations that have a role in frame development. GEOP is composed of three components: Geographic Delineations component (GEOP/GD), Geographic Partnerships component (GEOP/GP), and Geographic Data Processing component (GEOP/GDP). Also shown are the upstream and downstream operational influences, including the Field Infrastructure operation (FLDI), Address Canvassing operation (ADC), Local Update of Census Addresses operation (LUCA), New Construction program (NC), Redistricting Data Program operation (RDP), Count Review Operation (CRO), Response Processing Operation (RPO), Update Leave (UL) operation, Update Enumerate (UE) operation, Group Quarters operation (GQ), Enumeration at Transitory Locations operation (ETL), Nonresponse Followup operation (NRFU), Data Products and Dissemination operation (DPD), and Archiving operation (ARC).

This diagram covers frame development for the 2020 Census (stateside and Puerto Rico). It does not cover development of the frame for the Island Areas Censuses or Post-Enumeration Survey (Coverage Measurement) operations.

The discussion below walks the reader through the diagram, using the circled numbers to help the reader follow the flow.
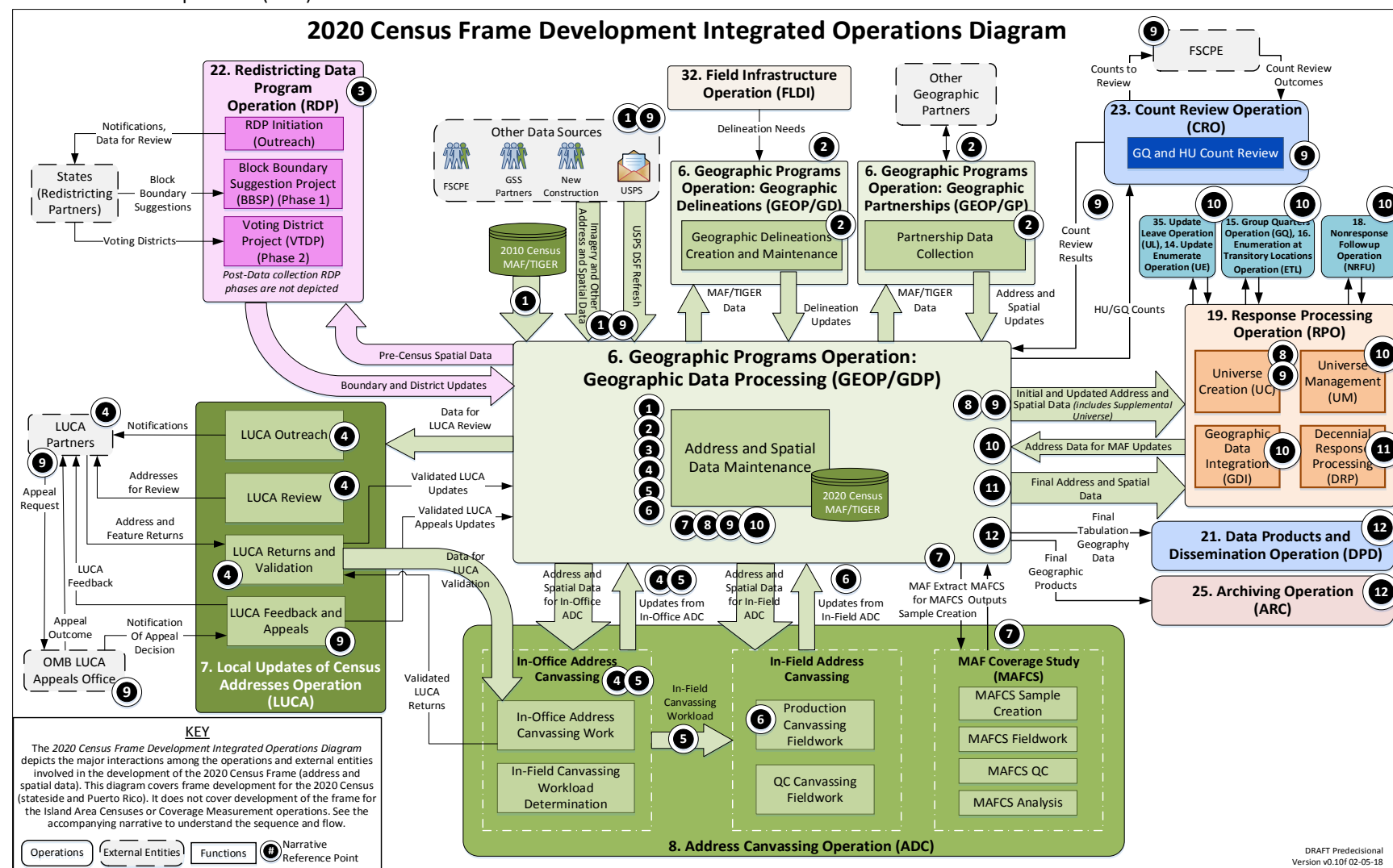
2020 Census Frame Development Integrated Operations Diagram

Figure 2: 2020 Census Frame Development Integrated Operations Diagram (IOD)

(1) Frame development for the 2020 Census includes, as a starting point, the 2010 Census address and spatial data from the Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database and any ongoing updates that have been performed throughout the early part of the decade. Frame development takes inputs from various external sources to update the address and spatial data in the MAF/TIGER system.

The United States Postal Service (USPS) typically provides data to the Census Bureau twice a year, in the spring and the fall, through the Delivery Sequence File (DSF). The DSF is the list of all addresses (and some related data) maintained by the USPS for mail delivery and is the most complete USPS address database available. GEOP processes the DSF with other data from the USPS through an activity collectively known as the "DSF Refresh."

Other sources, such as Federal-State Cooperative for Population Estimates (FSCPE) and Geographic Support System (GSS) Partners provide data to GEOP/GDP, which is used in validating and updating the MAF/TIGER data. Based on data from all these sources, GEOP/GDP updates the MAF/TIGER data throughout the decade.

(2) The GEOP/GP performs outreach activities to encourage and motivate participation in the Geographic Partnership Programs. Partner groups, including tribal, state, and local governments, and coordinating agencies, provide address and spatial data updates to GEOP/GP, which sends them to GEOP/GDP to update the MAF/TIGER data.

The GEOP/GD determines, delineates, and updates the geographic area boundaries for 2020 Census data collection and tabulation. GEOP/GD performs the delineation of various Collection Geography areas, based on the Basic Collection Unit (BCU), the smallest unit of collection geography for all 2020 Census listing-based operations. In an effort to ensure the most cost-effective and efficient process to enumerate households, every BCU in the United States is assigned to one specific Type of Enumeration Area (TEA). The TEA assignment for a given BCU is based on address types and other characteristics of the BCU, including an assessment of the likelihood of residents to self-respond and accessibility of the BCU. The TEA assignment determines the methodology used for frame creation and enumeration of the households within the BCU. Based on the needs of the FLDI operation, GEOP/GD also supports Field Management Area delineation, which includes delineation of geographic areas necessary to manage and accomplish the fieldwork for the 2020 Census. In addition to the collection geography delineation work described above, GEOP/GD is also responsible for 2020 Census Tabulation Geography delineation. Tabulation Geography delineation data are used by DPD at

the conclusion of the 2020 Census during the creation of the 2020 Census data products. GEOP/GDP updates the MAF/TIGER data to reflect both these kinds of delineations.

GEOP/GP and GEOP/GD activities began in 2016 and are ongoing throughout frame development.

③ In addition to inputs provided by partners through the GEOP/GP component, the 2020 Census includes an operation, RDP, which provides each state the opportunity to identify the small area geographies needed for legislative redistricting and the legally required Public Law (P.L.) 94-171 redistricting data tabulations by the mandated deadline of April 1, 2021, one year from Census Day. RDP includes activities to update the frame with current block boundary suggestions (2015 – 2017) and voting district project inputs (2017 – 2020).

Once RDP establishes which states will participate, it sends those states packages, including pre-census spatial data that reflect the boundaries and features in the MAF/TIGER data. The participants update these shapefiles and provide them back to RDP, which reviews them and resolves any issues. Once reviewed, the updated files are provided to GEOP/GDP for use in updating the MAF/TIGER data.

④ Another operation is Local Update of Census Addresses (LUCA). LUCA provides an opportunity for tribal, federal, state, and local governments to review and improve the address lists and maps as required by P.L. 103-430. LUCA sends an advance notice package to approximately 39,000 state, local, and tribal governments informing them about LUCA. Participating LUCA partners that have signed an agreement to protect the Title 13 data contained in the Census Bureau address files are provided review materials, including shape files and address data from MAF/TIGER for review. The material provided for LUCA review includes some MAF/TIGER updates from the ongoing In-Office Address Canvassing (ADC) work. The LUCA partners review the materials and provide any updates as address and feature returns. Address matching is used to match and flag returns for validation as needed. 2020 Census LUCA addresses that are not validated during address matching are sent to ADC for in-office validation. In-office validation results are returned to LUCA. LUCA provides updates for validated addresses from LUCA partner returns to GEOP/GDP for use in updating the MAF/TIGER data. Addresses that were not validated are subsequently sent back to LUCA partners as part of the LUCA feedback activity.

⑤ A critical part of frame development is Address Canvassing (ADC). ADC's purpose is to deliver a complete and accurate address list and spatial database for enumeration and to

determine the type and address characteristics for each living quarter. ADC comprises three main functions: In-Office Address Canvassing, In-Field Address Canvassing, and the MAF Coverage Study (MAFCS).

In-Office Address Canvassing is a continuous process that measures, assesses, and ensures the completeness and accuracy of the MAF and associated attributes and geospatial data. In-Office Address Canvassing, which began in September 2015 and continues during the frame development process, receives address and spatial data from GEOP/GDP. External updates to these data that occur during ADC are sent on an ongoing basis from GEOP/GDP as new information is provided by activities such as GEOP/GP and LUCA.

Any updates to address and spatial data resulting from In-Office Address Canvassing are provided to GEOP/GDP for incorporation into the MAF/TIGER data.

The BCUs that cannot be validated through In-Office Address Canvassing procedures or for which address characteristics cannot be adequately determined are sent to the field for in-person canvassing and become part of the In-Field Address Canvassing workload.

(6) In-Field Address Canvassing is the process of having field staff visit specific geographic areas to identify every place where people could live or stay. Field staff compare what they see on the ground to the existing census address list and either verify or correct the address and location information. Listers knock on every door to verify address information, collect associated mailing address information, and collect information about any additional housing units present at the address. Field staff also classify each living quarter as a housing unit or group quarter. The results are made available to GEOP/GDP to update the MAF/TIGER data.

(7) The MAF Coverage Study (MAFCS) is a recurring address canvassing operation to statistically determine the over/under coverage for the entire frame. MAFCS began in April 2016 and work continued into 2017. GEOP/GDP provides an extract of addresses from the MAF for the MAFCS to sample. The MAFCS performs fieldwork and analyzes the sample to determine any over-coverage and under-coverage issues resulting from the In-Office Address Canvassing work. The results of the MAFCS are used to improve In-Office Address Canvassing procedures. Unfortunately, the MAFCS was discontinued at the end of the second quarter in FY 2017.

(8) GEOP/GDP provides initial address and spatial data, including the TEA designations and the field management area delineations to RPO so it can create the initial enumeration case universe. RPO uses this information to create workload for each of the response data

operations, including Forms Printing and Distribution operation (FPD), Internet Self-Response operation, Census Questionnaire Assistance operation, as well as UL, UE, GQ, ETL, and NRFU.

(9) Additional updates to the MAF/TIGER data may be identified after the initial universe is sent to RPO as a result of the LUCA appeals, New Construction, CRO, and subsequent refreshes of USPS DSF data. These data are provided to RPO in what is known as the Supplemental Universe.

LUCA includes an appeals process to allow participants to contest the Census Bureau's responses to their inputs. Once LUCA participants receive their feedback materials in the summer of 2019, they have 30 calendar days to file an appeal with the LUCA Appeals Office within the Office of Management and Budget (OMB). Upon receipt of a LUCA appeal, the LUCA Appeals Office uses the supporting documentation sent by the participant to decide whether to accept or reject an appeal. Once OMB makes a determination on a LUCA appeal, it notifies the participant of the determination. The LUCA Appeals Office delivers accepted LUCA appeals to GEOP/GDP, which processes the appealed addresses, updating the MAF/TIGER data accordingly.

The New Construction program utilizes the expertise of tribal, state, and local governments to improve the accuracy and completeness of the address list used for the 2020 Census. The purpose of the New Construction program is to obtain city-style addresses for newly built housing units (HU) in blocks where census questionnaires are delivered through the self-response method. New addresses for units outside the self-response area will be added to the address list at the time of questionnaire delivery in UL areas or during the enumeration attempt in UE areas. The Census Bureau asks participants in the New Construction program to submit addresses of any HU for which basic construction (closing the structure to the elements) will be completed by or before Census Day (April 1, 2020).

CRO, in partnership with FSCPE, enhances the accuracy of the 2020 Census through remediating potential gaps in coverage by implementing an efficient and equitable process to identify missing housing units, and identifying and correcting missing or geographically misallocated large group quarters (GQ) and their population. For frame development, GEOP/GDP sends HU and GQ counts to CRO for validation. Any address changes resulting from CRO are incorporated into the MAF/TIGER data by GEOP/GDP.

(10) Additional frame development support is provided by address updates from UL, UE, GQ, and ETL, and from NRFU's field verification activities. As noted above, universe and address

updates occur during field operations. All listing results and other address changes identified through the field data collection operations are sent back to GEOP/GDP through the RPO Geographic Data Integration function.

(11) Once data collection is complete, the final address and spatial data are sent from GEOP/GDP to the RPO Decennial Response Processing Function, which uses the geographic data to prepare the response data for subsequent tabulation and data products creation activities.

(12) The final geographic data files (Tabulation Geography data) are sent from GEOP/GDP to DPD to be used in the creation of the various 2020 Census data products. DPD uses this geographic data to determine how to structure and layer the data by geographic area (e.g., state, city, and tract).

At the conclusion of the 2020 Census, ARC receives final geographic products from GEOP/GDP frame development to be transferred to the National Archives and Records Administration (NARA) as required.

2.4.2 CRO Data Flow and Operational Influences During Data Collection

Figure 3 is an Integrated Operations Diagram (IOD), which describes the design concepts for the response data collection operations for the 2020 Census (stateside and Puerto Rico). This diagram assumes that the frame has been developed and address canvassing operations are complete. The diagram shows the Response Processing operation (RPO) as the hub of data collection and RPO's interactions with all the other 2020 Census operations that have a role in data collection. The discussion below walks the reader through the diagram, using the circled numbers to help the reader follow the flow.
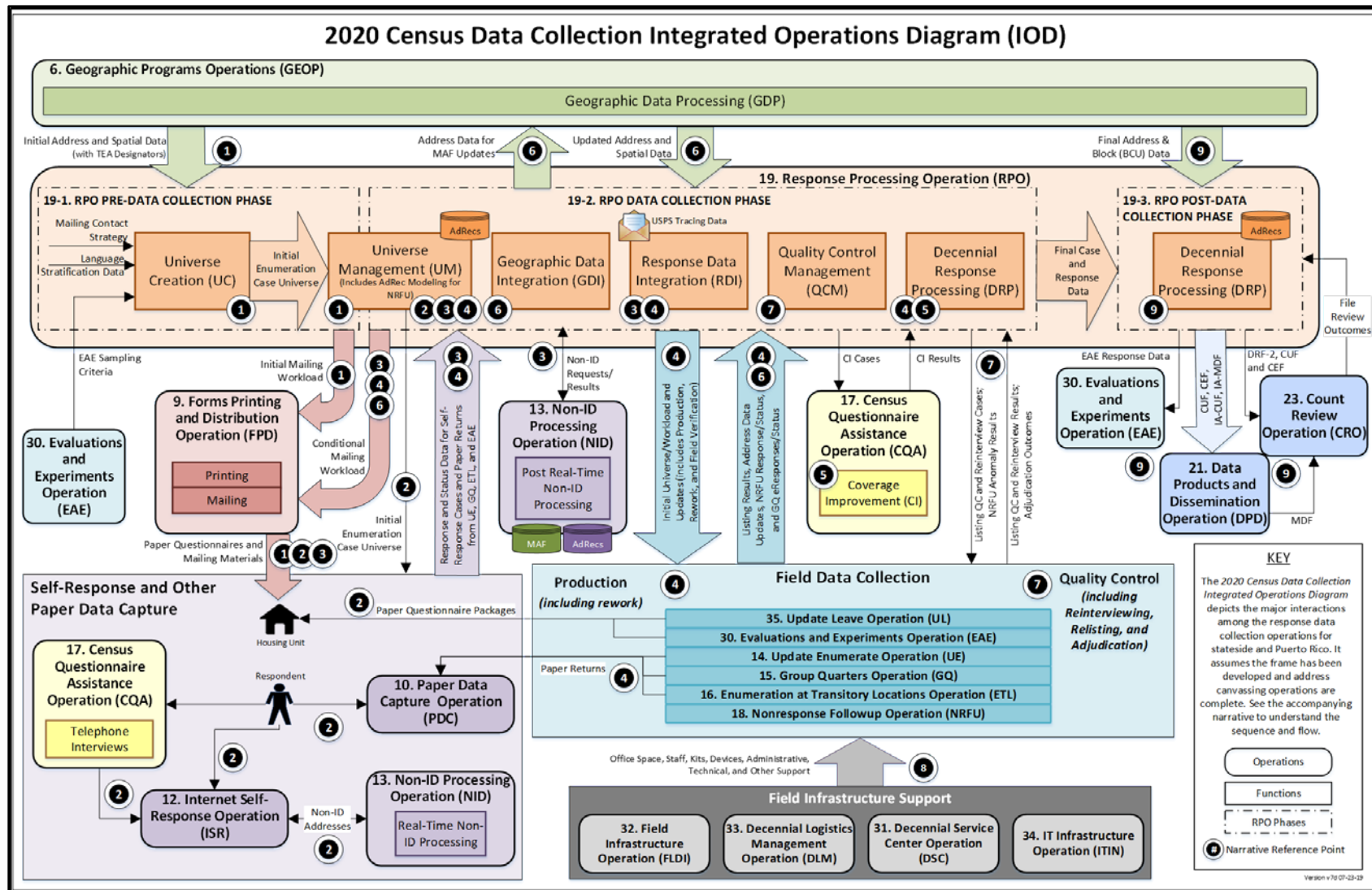
Figure 3: 2020 Census Data Collection Integrated Operations Diagram (IOD)

Pre-Data Collection

①Before the start of data collection, the Geographic Data Processing (GDP) component of the Geographic Programs operation (GEOP) sends initial Address and Spatial Data, including the Type of Enumeration Area (TEA) designations, to RPO so it can create the Initial Enumeration Case Universe. RPO also receives the mailing contact strategy (i.e., strategy for self-response stratification) so it can identify which housing units receive which kinds of mailings, language stratification information so it knows which language to use, and experimentation stratification data so it knows which housing units are to be included in what types of experiments. The creation of the initial Enumeration Case Universe and application of the stratification data are done as part of the RPO Universe Creation function.

Based on the stratifications, the RPO Universe Management function creates the initial mailing workload and sends it to the Forms Printing and Distribution operation (FPD), which prints and then mails the appropriate materials to mailable housing units for the Self-Response (SR) TEA. The first two of the five potential mailings for the SR TEA are sent unconditionally to all housing units in this TEA. These mailings are sent in English or English and Spanish based on the language stratification data and may include letters or—based on the self-response stratification—questionnaires.

During Data Collection

②Once the RPO Universe Creation work is complete, the Initial Enumeration Case Universe is managed by the RPO Universe Management function, which tracks changes to the enumeration universe for future mailings and for the data collection operations.

People living in housing units are encouraged to self-respond through a partnership and communications campaign (not shown on this diagram), through mailings sent by FPD, and through paper questionnaires left at housing units as part of the Update Leave operation (UL).

To make it easy for people to respond and to reduce the paper workload, the Census Bureau is using an *Internet First* strategy for most housing units. Respondents can go to the internet and enter their response using the internet instrument as part of the Internet Self-Response operation (ISR). The internet option offers additional flexibility and allows people to respond in multiple languages. If a respondent calls the Census Questionnaire Assistance operation (CQA), a customer service representative may offer to collect the respondent's information by telephone. The information collected from these telephone interviews is entered by a customer

service representative using an ISR instrument similar to the public-facing instrument used by respondents.

Respondents can also mail paper questionnaire forms. These forms are received by the Paper Data Capture operation (PDC), which uses scanning and imaging technology to capture the information from these forms.

ISR receives the Initial Enumeration Case Universe from the RPO Universe Management function and uses the Enumeration Case Universe to link responses provided through the internet instrument to the appropriate case. If respondents do not have their unique Census ID available, they are still able to complete the census questionnaire as a Non-ID response using the ISR instrument. The Non-ID Processing operation (NID) first attempts to match the address entered by the respondent or customer service representative to a known census address in real-time. For addresses that do not match, the response is still collected and is subject to later Non-ID Processing.

③ Response and status data collected through the various self-response data collection operations are sent (in digital format) to RPO's Response Data Integration function. Any responses collected through PDC or ISR that are submitted in languages other than English or Spanish are translated by staff at the Tucson call center on behalf of these operations before being sent to RPO. RPO's Universe Management function uses the response status data to determine the appropriate actions for the case.

During the self-response data collection time-period, reminder mailings are sent to housing units in the SR TEA. The first reminder is sent to all housing units in the SR TEA using the initial mailing workload as discussed above. Subsequent reminders are conditional and are only sent to those housing units that have not yet responded. The RPO Universe Management function sends a Conditional Mailing Workload to the FPD operation for these nonresponding units. FPD also receives from the RPO Universe Management function a list of mailable housing units in the UL TEA and mails two reminders to these housing units.

Any remaining Non-ID cases are sent by RPO to NID for post real-time Non-ID processing, which attempts to match addresses provided by respondents to known addresses in the Master Address File (MAF) using automated and clerical procedures. As needed, administrative records (AdRecs) are used to supplement the matching process. Most of these Non-ID cases will be from internet responses that could not be matched during real-time Non-ID processing. In addition, post data capture Non-ID processing will be required for paper forms for which the Census ID could not be read during data capture. The results of post real-time Non-ID matching are sent back to RPO. Based on predefined business rules, some of the responses that are not

able to be matched through NID are sent to the field for verification as part of the Nonresponse Followup operation (NRFU).

④ The discussion above covers self-responses for people living in housing units. Special operations also exist to collect data from people living in other types of living quarters or for whom self-response is not a viable option:

- The Group Quarters operation (GQ) enumerates people living in group quarters (e.g., dormitories, correctional facilities, and nursing/skilled-nursing facilities) as well as people experiencing homelessness and receiving services at service-based locations such as soup kitchens. GQ also enumerates people living on maritime vessels and living in the Military TEA, which includes both on-base group quarters and on-base housing units.

- The Enumeration at Transitory Locations operation (ETL) enumerates people who are living in special locations such as recreational vehicle parks, campgrounds, racetracks, circuses, carnivals, marinas, hotels, and motels and who do not have a Usual Home Elsewhere.

- The Update Enumerate operation (UE) lists and enumerates housing units in areas that pose unique challenges to the standard self-response data collection operations. These housing units are in the UE and Remote Alaska TEAs, which cover remote areas of the country and other small selected areas.

NRFU is another special operation whose primary purposes are to determine the housing unit status of addresses in the SR and UL TEAs for which a self-response was not received and to enumerate those that are believed to be occupied. As mentioned in number 3 above, NRFU also performs a field verification activity to verify selected addresses for Non-ID self-responses that could not be matched to known addresses through NID.

Based on the universe case type (derived from TEA and living quarter type), RPO sends the Initial Enumeration Case Universe/Workload to the GQ, ETL, and UE operations. GQ uses this universe to perform an advance contact activity to collect general information and determine the preferred method of enumeration. ETL also performs an advance contact activity to schedule appointments for enumerating its universe of cases.

NRFU does not require advance contact activities. For NRFU, the RPO Universe Management function creates an Initial Case Universe/Workload comprising all housing units in the SR and UL TEAs for which a self-response was not received. The NRFU contact strategy is dependent on

the results of an AdRec modeling activity. Four possible status outcomes result from this modeling for a given address:

- AdRec Vacant: No one lives there.
- AdRec Delete: There is no housing unit at that address.
- AdRec Occupied: There is a high probability that someone lives there and that the Census Bureau has high-quality data about that housing unit.
- Full Contact: Administrative data are not sufficient to help determine the housing unit status, and a full contact strategy is required.

An initial attempt to enumerate is made for all addresses in the NRFU workload. NRFU sends to RPO information regarding the success of this and any subsequent enumeration attempts as part of the response status data.

AdRec Vacant and AdRec Delete housing units also receive an additional mailing from FPD. The RPO Universe Management function provides this additional mailing workload to FPD (as another type of Conditional Mailing).

RPO removes from the follow-up workload any AdRec Occupied cases that cannot be successfully resolved during the first attempt and triggers one final mailing (from FPD) to these addresses to encourage these households to self-respond. RPO also removes AdRec Vacant and AdRec Delete cases that cannot be successfully resolved during this first attempt, provided that those cases do not appear occupied and that information from the United States Postal Service (USPS) about the additional mailing indicates that the unit is either vacant or non-existent. For all other cases, NRFU continues to attempt to enumerate the housing unit until the attempt is successful or the maximum number of attempts has been reached. Additional attempts are made for selected units during the NRFU Closeout phase based on a reassessment of the AdRec modeling results using a relaxed, lower quality threshold.

Self-responses can continue to arrive at any time during NRFU. Accordingly, RPO flags housing units in the follow-up workload for which RPO has received a self-response or tracing information from the USPS that indicates that a return is on its way to one of the paper data capture facilities. NRFU is notified about these flagged households as soon as the information is available so that it can remove the housing units from the daily workload, if possible. Any self-responses that are flagged but later found by RPO to have insufficient enumeration data are added back to the NRFU workload for continued enumeration attempts. The RPO Universe Management function tracks this information and uses it to determine what to include in the next day's follow-up workload. Housing units that have been successfully enumerated are not included in subsequent follow-up workloads.

For NRFU, field data are collected through electronic devices. The electronic data are sent to the RPO Response Data Integration function, which subsequently provides this information to the Decennial Response Processing function for further processing. Paper questionnaires are used to enumerate at living quarters during UE and at housing units during ETL. These paper questionnaires are checked-in at area census offices (ACOs) and then sent to the paper data capture facilities, where they are scanned and imaged by PDC. PDC sends the captured data and case status information to RPO in digital format.

GQ is primarily a paper operation. Group quarter responses collected on paper questionnaires are checked-in at the ACOs and sent to PDC for scanning and imaging before being transmitted to RPO. Case status updates are sent to RPO as part of the check-in process. GQ data provided in electronic files (eResponses) require additional processing to prepare the data before they are electronically transmitted to RPO. GQ data collected on paper rosters are entered by ACO clerks into the same file format that is used for eResponses. These response data are then sent electronically to RPO.

As part of the Evaluations and Experiments operation (EAE), the Census Bureau may test different questionnaire content and data collection methodologies during the 2020 Census to help evaluate content and modes for the 2020 Census and inform design changes for the 2030 Census. Addresses that are selected to be part of these experiments are identified in the initial universe (see number 1 above). For those addresses, the EAE operation sends households questionnaires with various experimental items, packaging, etc. to assess the impact made on the response or lack thereof. Respondents receiving EAE questionnaires and notices will respond via ISR, CQA, PDC or NRFU.

⑤ RPO's Decennial Response Processing function performs quality assurance activities as well as coding and other preparation steps on incoming self-response data.

The RPO Universe Management function also supports a Coverage Improvement (CI) activity, the goal of which is to ensure a high-quality census by conducting telephone followup for households where there could be coverage issues on submitted responses. CI is a followup activity and is therefore considered a component of NRFU; however, the CI telephone interviews are performed by CQA. CQA receives from the RPO Universe Management function a set of cases with potential coverage issues and provides the results of these cases back to RPO's Response Data Integration function.

⑥ As noted above, universe and address updates occur during field operations. Census Bureau field staff may uncover changes to addresses as they perform their daily assignments in

any field operation. For example, a UL or UE lister may add an address or find an error in the address or geographic data based on the listing activities, or a NRFU enumerator or a UL lister may go to an address and find an additional unit such as a garage apartment located on the premises. All listing results and other address changes are sent to the RPO Geographic Data Integration function, which passes the information on to the GDP function in GEOP.

Changes to the address list may also come from other sources such as appeals from the Local Update of Census Addresses operation (LUCA), the review of addresses performed by the Count Review operation (CRO), and updated files from the postal service. The GDP function within GEOP updates the address data and sends these RPO's Universe Management Function, which provides these cases to the appropriate operation. Depending on the timing, living quarter type, and TEA designation, RPO may initiate one or more mailings to these new addresses through FPD to encourage self-response.

(7) All field operations (GQ, UL, ETL, UE and NRFU) include quality control (QC) functions. For GQ, the RPO Quality Control Management function creates and sends a sample of the field enumeration cases to ACO staff, who conduct telephone reinterviews for this sample set of cases to confirm that a GQ enumerator visited the site and that the total population count is correct.

For UL, the RPO Quality Control Management function selects a sample set of basic collection units (BCUs) for relisting. The QC Listing Results are sent back to the RPO Quality Control Management function for further processing. RPO does not send any changes resulting from UL listing to GEOP until the lister has passed the QC check. Further, if the QC activities result in a hard fail, BCUs already worked may require relisting. RPO includes this rework in subsequent UL production workloads.

QC methods for ETL and UE will be performed primarily in the field, tailored to meet the circumstances of these unique paper-based operations.

NRFU includes multiple methods for ensuring high-quality data collection. Several of these are integrated into the staff management activities. In addition, samples of field followup cases are selected for reinterview (RI), a process whereby the response data are collected again and compared with the original collected data. The RPO Quality Control Management function creates the RI workload and sends it to the NRFU operation. The RI cases are handled by NRFU field staff. The RI results are sent to the RPO Quality Control Management function, which performs an automated comparison of the RI data against the original data. Anomalies are sent back to NRFU, where additional research is conducted to determine how these cases should be handled. The results of this review (adjudication outcomes) are sent back to the RPO Quality

Control Management function. In some cases, the adjudication requires that prior cases performed by the enumerator at fault be reworked. RPO puts these cases back into the NRFU workload as appropriate.

(8) NRFU, UE, UL, ETL, and parts of the GQ operation are performed in the field. Several operations provide the support for these field data collection activities. The Field Infrastructure operation (FLDI) recruits, hires, onboards, and trains the staff needed to conduct these operations and also operates the field offices during production. The Decennial Logistics Management operation (DLM) provides the space and logistics support (e.g., supplies, kits, etc.) for the offices and the field staff. The Decennial Service Center operation (DSC) provides technical support for field and field office staff. Finally, the IT Infrastructure operation (ITIN) provides the hardware and software used by the field staff and field offices.

Post-Data Collection

(9) Once data collection is complete, additional processing occurs to prepare the counts for use in apportionment and the data used by the Data Products and Dissemination operation (DPD) to create data products for redistricting and other purposes. The RPO Decennial Response Processing function handles this post-data collection processing, which includes multiple activities:

- Supplementing response data with administrative records for those cases that had been identified as AdRec Occupied but for which a nonresponse followup attempt was unsuccessful and no subsequent self-response was received.

- Determining the final enumeration universe by reconciling or applying final address and block data from the GDP component of GEOP.

- Determining the returns of record for situations where multiple responses have been received for the same housing unit.

- Performing count and status imputations.

- Performing consistency editing and characteristic allocation supplemented with administrative records data.

- Applying tabulation geography.

- Performing disclosure avoidance (Note: This is done by RPO for Island Areas Censuses data only. Disclosure avoidance for stateside/PR data is handled by DPD).

Similar processing occurs for responses from group quarters. Responses collected through the EAE operation may require slightly different activities.

Through these processing activities, the RPO Decennial Response Processing function creates multiple files for Stateside/PR response data, including the Decennial Response File (DRF), the Census Unedited File (CUF), and the Census Edited File (CEF). RPO also creates an Island Areas CUF (IA-CUF), Island Areas CEF (IA-CEF), and Island Areas Microdata Detail Files (IA-MDF) for the Island Areas Censuses (IAC) response data. Each of these files is reviewed within the Census Bureau before the data are sent to the next stage of processing: Some of these reviews are done as part of the CRO. The CUF, the CEF, the IA-CUF, and the IA-MDF are sent to DPD through the Census Data Lake (CDL). DPD uses these files as inputs for data products creation and also creates the Stateside/PR MDFs using the CEF as input. RPO also sends data collected as part of EAE back to the EAE operation for further analysis.

3. Count Review (CRO) Detailed Process Description

Figure 4 is a top-level Business Process Model (BPM) showing the Level 1 activity areas within the CRO operation. BPMs for the 2020 Census follow industry-standard Business Process Model and Notation (BPMN). An explanation of how to read the BPMN notations and a full-sized copy of all of the BPMN diagrams for this operation are provided under separate cover.

This top-level BPM serves as the Context Model for the CRO operation. A BPMN Context Model displays the high-level activities within the operation and relationships between them, whereas the IDEF0 Context Diagram shown earlier depicts the boundaries of the operation or activity and the interfaces between the operation or activity and other operations and activities with which it is associated.
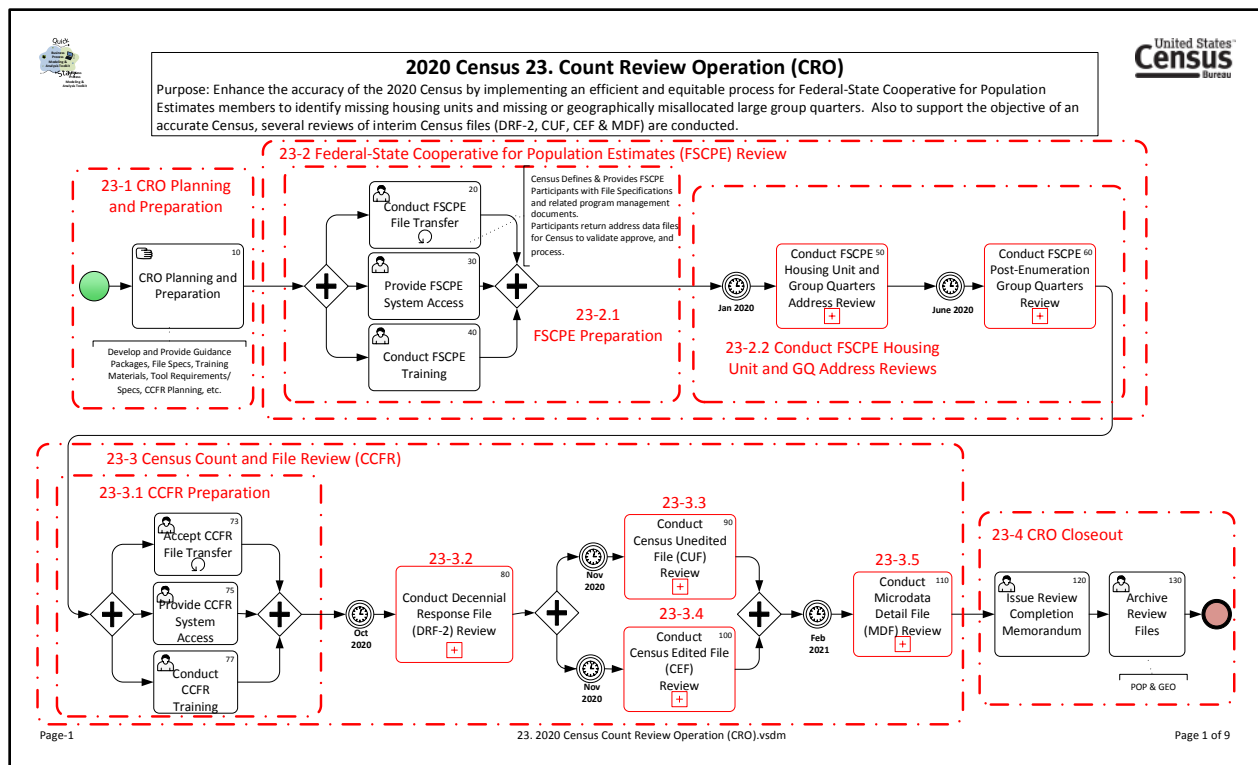

Figure 4: CRO Operation Context Model

The CRO operation is subdivided into the following Activity Areas:

- CRO Planning and Preparation [CRO 23-1].
- Federal-State Cooperative for Population Estimates (FSCPE) Review [CRO 23-2].
- Census Count and File Review (CCFR) [CRO 23-3].

- CRO Closeout [CRO 23-4].

The business processes for each of these Level 1 activity areas are discussed along with their inputs and outputs in the following subsections.

3.1 CRO Planning and Preparation [CRO 23-1]

Figure 5 shows the BPM for the CRO Planning and Preparation [CRO 23-1] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the CRO operation.
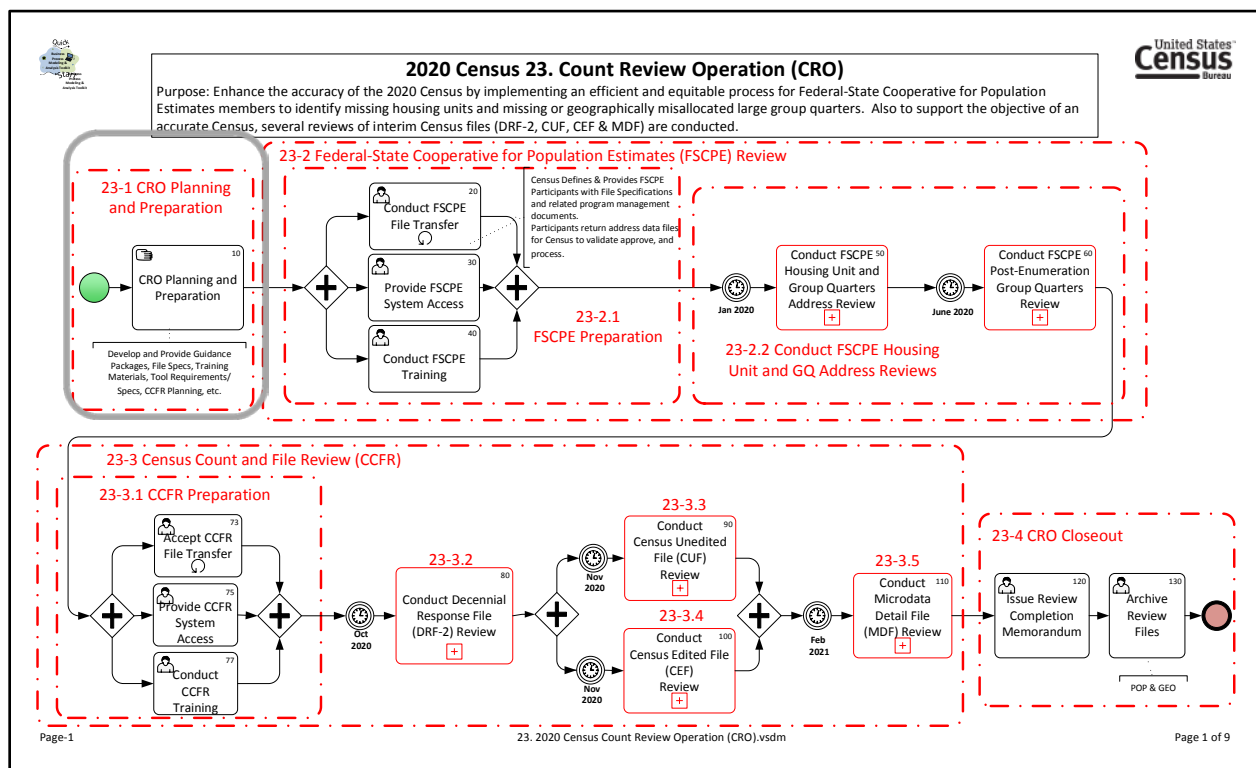

Figure 5: CRO Planning and Preparation [23-1] Constituent Activities

The CRO Planning and Preparation activity area is not subdivided further and is described below.

The specific goal of the 2020 CRO is to identify missing HUs and missing or misallocated large GQs and correct these within the time and resource constraints of the overall 2020 Census schedule.

CRO has been fully integrated with other 2020 Census operations. This integration will permit the findings from CRO to flow into subsequent census operations. State-of-the-art software will allow for address level precision in identifying missing HUs and GQs—with supporting evidence—for enumeration in the 2020 Census. Advance communication with FSCPE participants and their organizations or agencies, accompanied by training opportunities, will position participants to begin gathering quality address lists and optimize their time during the review events.

Software tools have been developed for both FSCPE Review and CCFR to enhance both Census Bureau staff and FSCPE participant analytical capabilities for identifying potential review cases. CRO is working with GEO on the development of GUPS, CRO-PCS, and GQPCS. These applications will be used to perform the FSCPE review. Additionally, CRO is working with UTS on developing the Census Review, Analysis, and Visualization Application (CRAVA) for review of the DRF-2, CUF, CEF and MDF during CCFR.

3.2   FSCPE Review [CRO 23-2]

Figure 6 shows the BPM for the FSCPE Review [CRO 23-2] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the CRO operation.
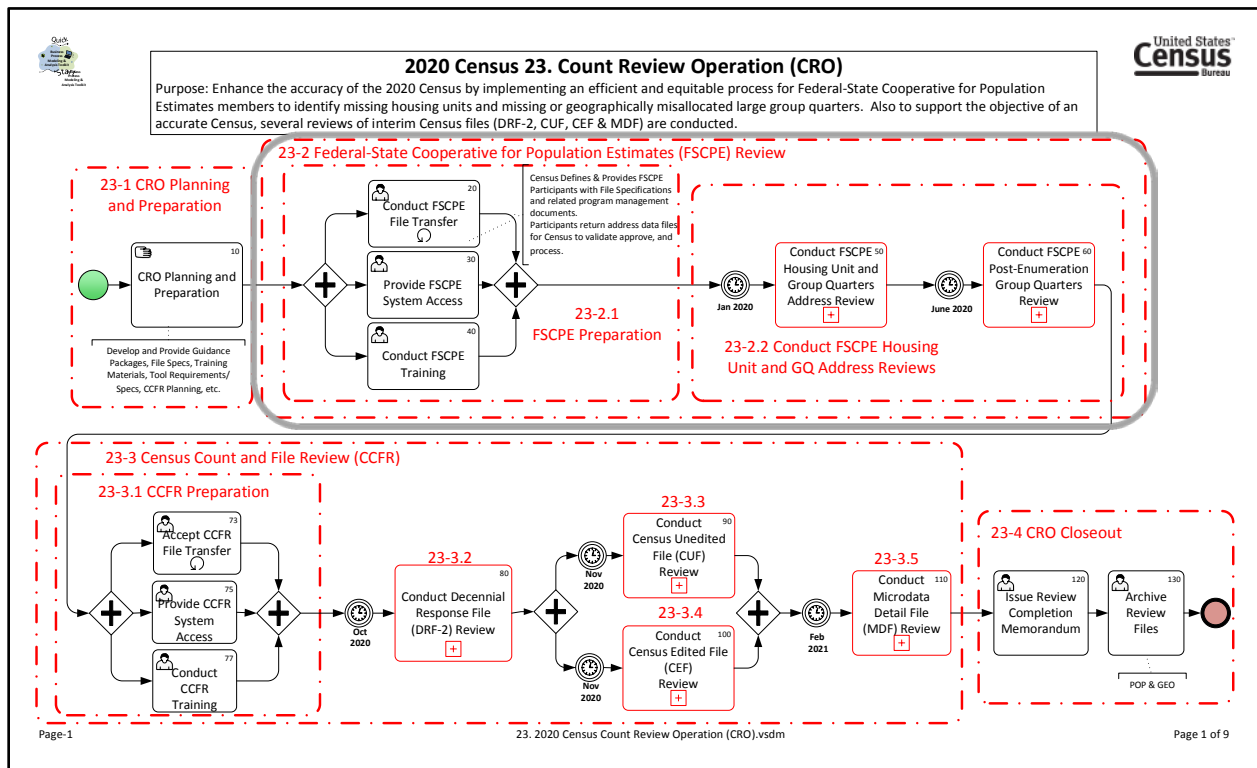
Figure 6: FSCPE Review [23-2] Constituent Activities

The Federal-State Cooperative for Population Estimates (FSCPE) Review activity area is subdivided into the following operational subactivities:

- FSCPE Preparation [23-2.1].
- Conduct FSCPE Housing Unit and GQ Address Reviews [23-2.2].

FSCPE participants will have the opportunity to enhance the accuracy and completeness of the 2020 Census. By using specially developed geospatial software, states can make comparisons between the Census Bureau's MAF and their own data sources to identify potentially missing housing units and missing or misallocated group quarters at key points during Census operations.

Subsequent sections describe the FSCPE Review operational subactivities in detail.

3.2.1 FSCPE Preparation [23-2.1]

A detailed view of the activities that make up the "FSCPE Preparation" operational subactivity appears in Figure 7 below.
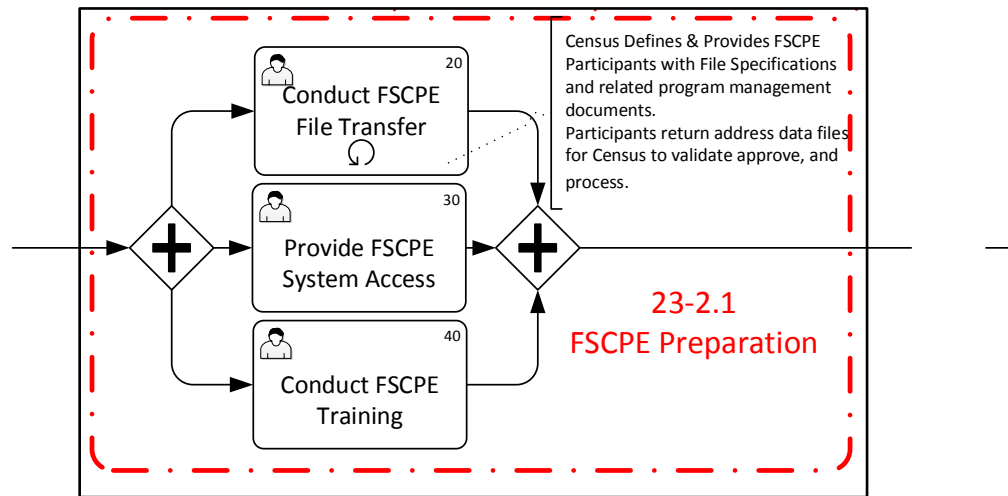
Figure 7: FSCPE Preparation [23-2.1]

Each state will have the chance to submit files containing housing units and group quarters addresses prior to the review events using the Census Bureau's Secure Web Incoming Module website. These files will be standardized by each state participant using templates provided by CRO. CRO staff will provide address file preparation guidance to participants in the form of written documents and webinar trainings.

The addresses in scope for CRO are city-style HU addresses and both city-style and non-city-style addresses of the following large GQs:

- Certain Adult Correctional Facilities (codes 103-105)
    - State Prisons (code 103)
    - Local Jails and Other Municipal Confinement Facilities (code 104)
    - Correctional Residential Facilities (code 105)
- Nursing Facilities/Skilled-Nursing Facilities (code 301)
- College/University Student Housing (codes 501-502)
- Military Quarters (code 601)
- Workers' Group Living Quarters and Job Corps Centers (code 901)

Federal Detention Centers (code 101) and Federal Prisons (code 102) are considered out-of-scope for CRO. Counts for those facilities will be obtained directly from the responsible federal agencies and will not be available for matching in time for CRO.

Census Bureau staff from CRO and GEO will validate all address data received for inconsistencies with provided standards. Addresses that fail validation will be returned to state participants for additional checks and potential resubmission prior to the deadline while

adhering to Census Bureau data confidentiality requirements. Once validated, state-submitted addresses will then be ingested and matched with existing addresses in the MAF/TIGER database by GEO for use during CRO.

The result of this match will be FSCPE Count Comparison File 1, which will contain state and MAF address data for review in GUPS. Specific measures will also be provided, such as percent of addresses matched and HU and GQ counts by various levels of geography (e.g., county, tract).

State participants will be granted Census Bureau network access through individual VDI accounts. In order to receive network access, each state participant will receive security clearance through a background investigation and, if favorably adjudicated, granted Special Sworn Status after completing all required data stewardship and technology training.

Participants will receive training by CRO staff at Census Bureau headquarters in September 2019. Recordings comparable to this training will be made available online through the secure Count Review SharePoint extranet website.

3.2.2   Conduct FSCPE HU and GQ Address Reviews [23-2.2]

The "Conduct FSCPE Housing Unit and GQ Address Review" operational subactivity is subdivided as Figure 8 below illustrates, which shows the following activities.

- Conduct FSCPE HU and GQ Address Review [23-2.2.1].
- Conduct Post-Enumeration Group Quarters Review [23-2.2.2].
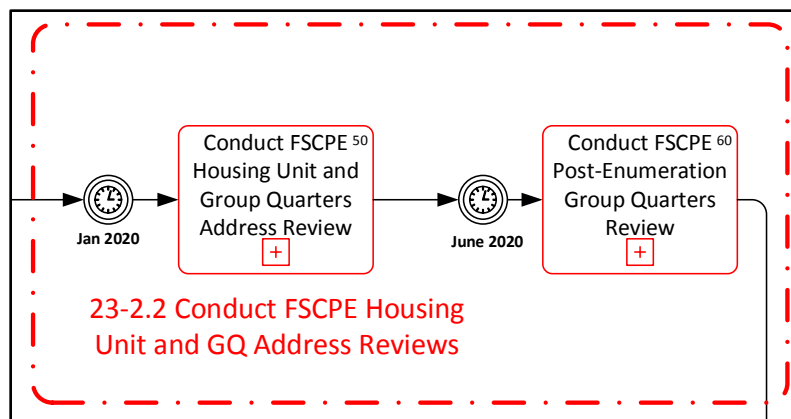

Figure 8: Conduct FSCPE Housing Unit and GQ Address Review [23-2.2] Constituent Activities

The objective of the HU and GQ Address Reviews is to identify HUs and GQs that are missing or misallocated. These reviews will take place during two events: Review Event 1 (HU and GQ

Address Review) prior to enumeration, and Review Event 2 (Post-Enumeration GQ Review). State participants will be provided two options for completing their review. For the first time, participants will be permitted to conduct their review remotely using their Census Bureau VDI accounts. An option to conduct review on-site at Census Bureau headquarters will also be available. However, based on the lower cost of implementing VDI, state participants who elect to review data remotely will also have a longer funded time period during which to conduct their reviews. Regardless of the chosen option, participants will use the same individual VDI account.

During each review event, Census Bureau staff will serve as liaisons to the state participants to answer questions, assist with identifying cases for submission, and ultimately review and approve cases that will then be sent to the appropriate operation (NRFU, GQE, or Late GQE).

3.2.2.1 Conduct FSCPE Housing Unit and Group Quarters Address Review [23-2.2.1]

Figure 9 below shows the work to prepare to perform Conduct FSCPE Housing Unit and Group Quarters Address Review.
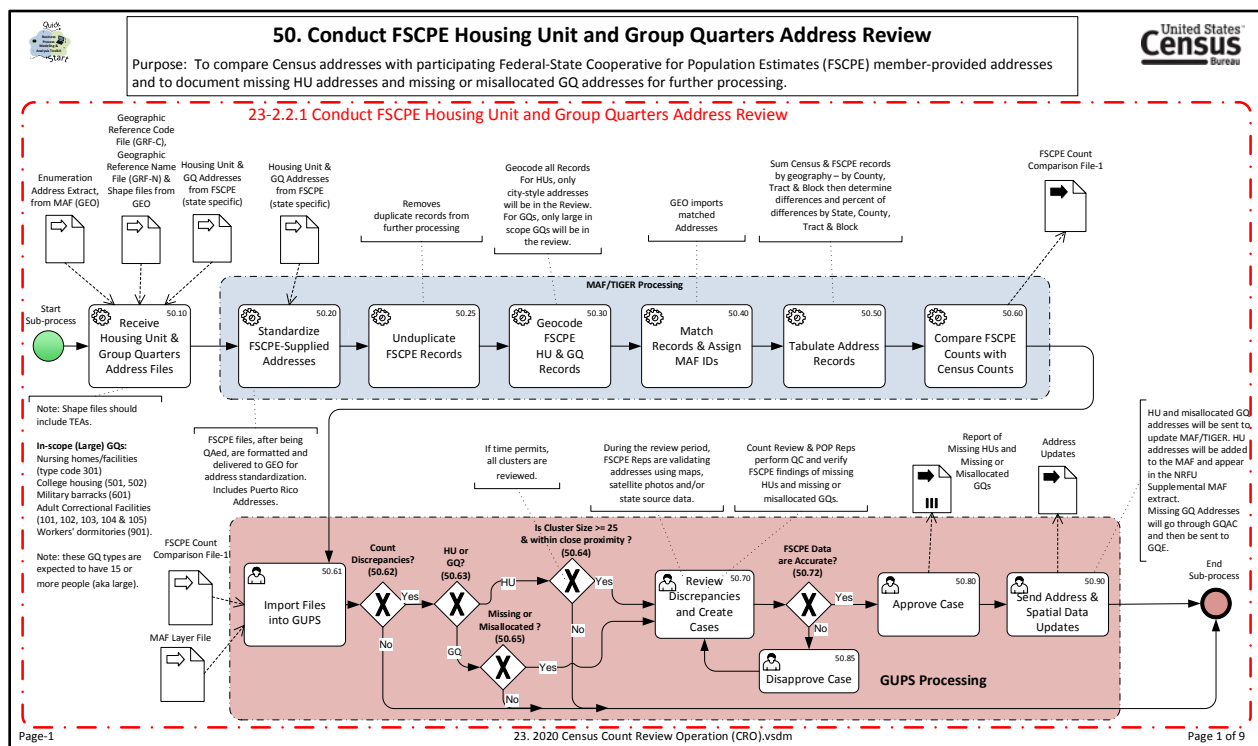

Figure 9: Conduct FSCPE Housing Unit and Group Quarters Address Review [23-2.2.1]

During the HU and GQ Address Review Event (Review Event 1), state participants will have the opportunity to identify clusters of 25 or more missing state HUs and missing or misallocated GQs. Review Event 1 occurs from January 13, 2020, to February 6, 2020. On-site review will be available from January 27-31, 2020. This timing permits the review findings to be incorporated into NRFU and GQE operations.

FSCPE participants will use GUPS to perform this review. Each reviewer will have access to their standalone GUPS application and the FSCPE Count Comparison File 1 for their state using their own VDI account. These files will be stored by GEO. Generally, review will be conducted county-by-county within the FSCPE participant's state.

The HU review process involves the following general workflow:

- Using GUPS, review study area for unmatched state-submitted HUs.
- Draw a polygon around a cluster of 25 or more possible missing HUs within GUPS to create a review case. The points within the polygon will correspond to state HUs that were not matched to Census Bureau addresses.
- Using guidance provided by the Census Bureau, research and provide evidence that the addresses actually exist to validate that they are eligible missing habitable HUs.
- Submit the missing HU case.

The GQ review consists of:

- Using GUPS, review study area for unmatched or misallocated GQs.
- Draw a polygon around the GQ(s) believed to be missing, misallocated, or in need of an information update (incorrect GQ or facility name).
- Using guidance provided by the Census Bureau, research and provide evidence that the address actually exists to validate that it is an eligible missing GQ, or to support that the location or attributes (GQ or facility name) are incorrect.
- Submit the missing or misallocated GQ case.

During the address review, each state will have a Census Bureau staff liaison assigned to them. This liaison will provide support during the review, adjudicate address cases, and notify GEO about review completion. Specifically, the liaison will review cases submitted by FSCPE participants and determine if each case complies with evidentiary guidance. When review of a county or equivalent is completed, the liaison will notify GEO that the file is available for processing. If the case is not approved, the liaison will communicate with the FSCPE participant and indicate why the case was not approved.

GEO will use the approved HU cases to update the MAF and create a supplemental file for use during the NRFU operation. Approved GQ cases will be loaded to GQPCS and then sent for enumeration through the GQE operation.

3.2.2.2   Conduct Post-Enumeration Group Quarters Review [23-2.2.2]

Figure 10 below shows the work to prepare to perform Conduct Post-Enumeration Group Quarters Review.
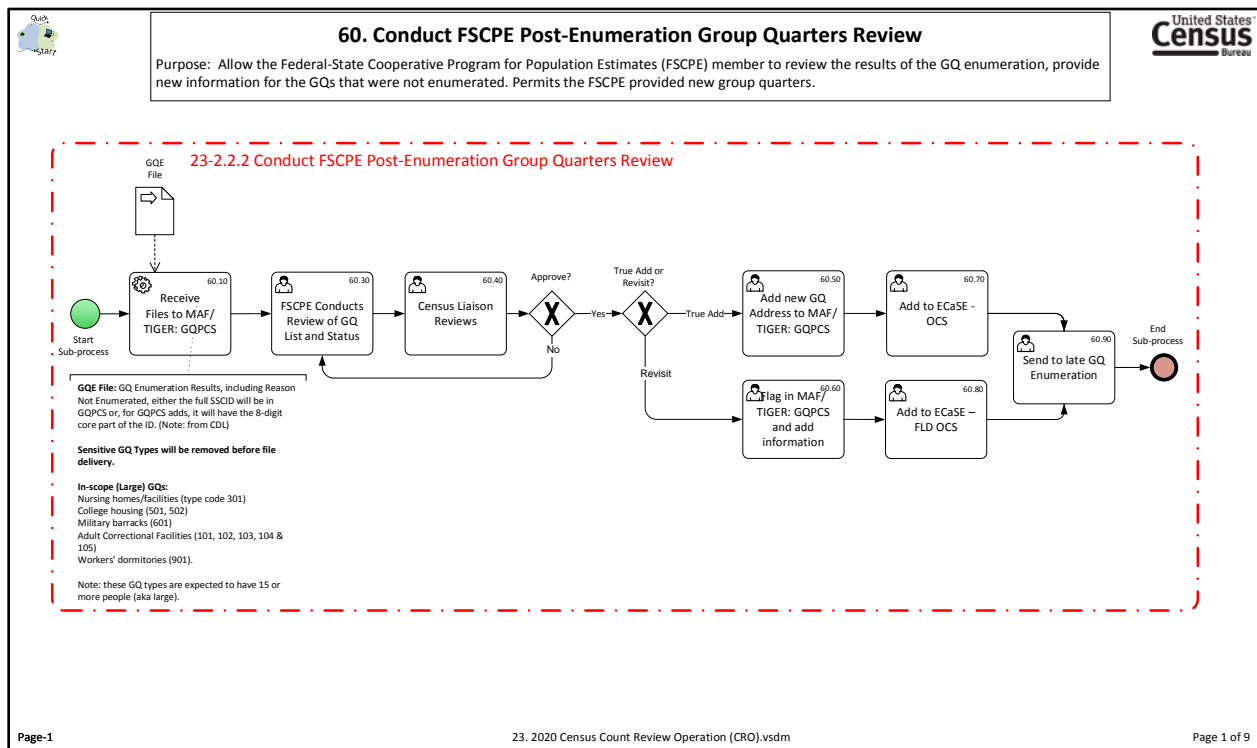

Figure 10: Conduct Post-Enumeration Group Quarters Review [23-2.2.2]

During the Post-Enumeration GQ Review Event (Review Event 2), state participants will have the opportunity to review the enumeration status of in-scope GQs in their state, following GQE. Reviewers will use GQPCS to view whether a particular GQ was enumerated or not enumerated, and if not, what was the reason. GUPS will also be available for reviewing GQ points on a map.

Review Event 2 occurs from June 15-19, 2020, after GQE is completed. On-site review will be available from June 16-17, 2020. This timing permits the review findings to be incorporated into the Late GQE operation.

If a GQ was not enumerated, state participants can provide information using GQPCS to inform Census Bureau field representatives during the Late GQE operation. Information that can be updated will include address, contact person name, telephone number, etc. Reviewers can also add new GQs that were in operation on Census Day (April 1, 2020) but are missing from the GQ universe.

3.3 Census Count and File Review (CCFR) [CRO 23-3]

Figure 11 below shows the BPM for the Census Count and File Review (CCFR) [CRO 23-3] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the CRO operation.
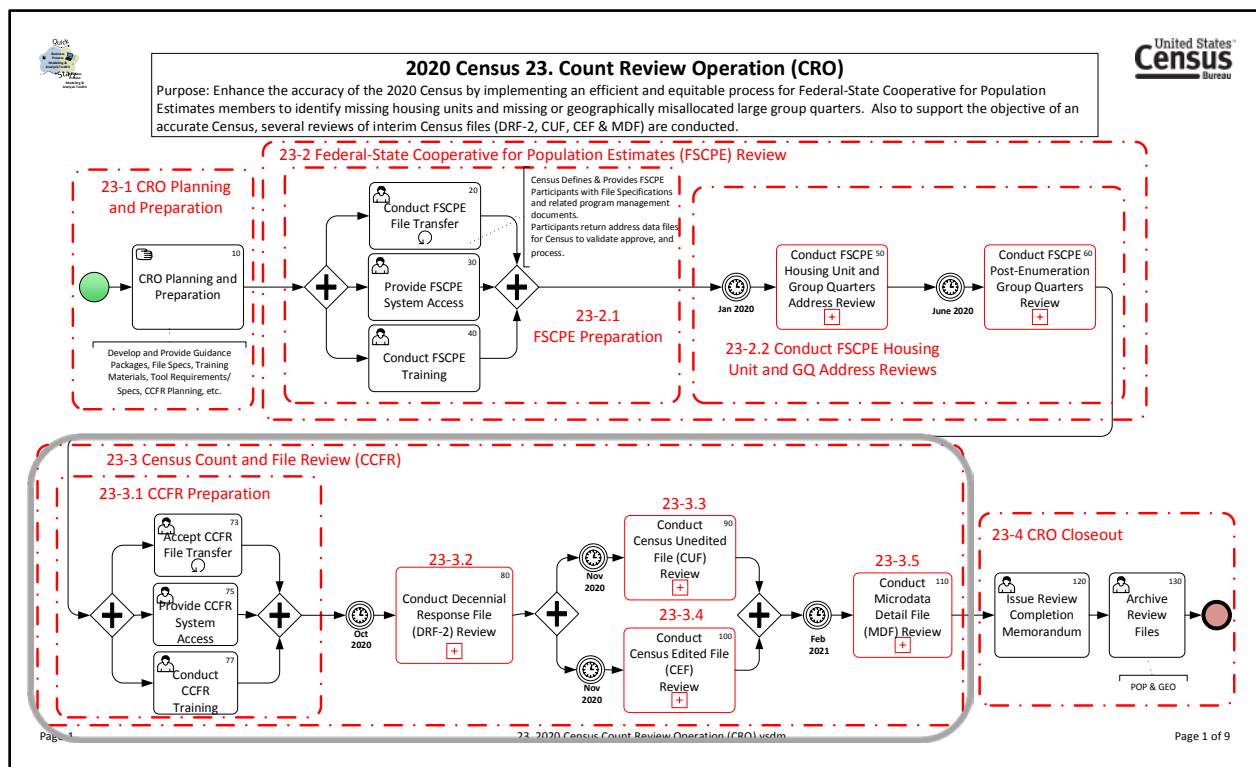

Figure 11: Census Count and File Review (CCFR) [23-3]

The Census Count and File Review (CCFR) [CRO 23-3] activity area is subdivided into the following operational subactivities:

- CCFR Preparation [23-3.1].

- Conduct Decennial Response File (DRF-2) Review [23-3.2].

- Conduct Census Unedited File (CUF) Review [23-3.3].

- Conduct Census Edited File (CEF) Review [23-3.4].

- Conduct Microdata Detail File (MDF) Review [23.3.5].

The objective of CCFR is to determine how reasonable the results of 2020 Census data collection efforts appear to be at several levels of geography compared to multiple sets of benchmark data as the data transform between the DRF-2, CUF, CEF, and finally MDF. CCFR also includes the edit review process, which verifies that each person and housing unit on the CEF have valid values in the person and housing items and ensures consistencies among characteristics. The MDF features final counts after tabulation recodes of the demographic data are applied and disclosure avoidance procedures are performed. This review ensures the data remain demographically reasonable after disclosure avoidance, and that all issues identified in the DRF-2, CUF, and CEF reviews have been addressed.

Subsequent sections describe the Census Count and File Review (CCFR) operational subactivities in detail.

3.3.1   CCFR Preparation [23-3.1]

Figure 12 below shows the work to perform CCFR Preparation.
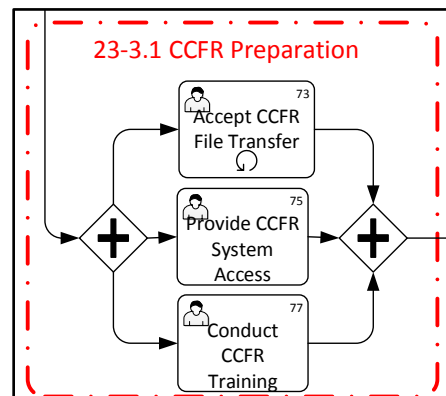

Figure 12: CCFR Preparation [23-3.1]

CCFR Preparation consists of several concurrent processes: accepting CCFR file transfer, providing CCFR system access, and conducting CCFR training.

In advance of the review, a number of file transfers are required. Specifically, POP receives tables from the Decennial Information Technology Division (DITD) for each file review, which will be used to create datasets by state; benchmark data from the Population Estimates Program and the American Community Survey for use in creating the input files for the CCFR review tool; and the Geographic Reference Code File, Geographic Reference Name File, and shapefiles from GEO.

Concurrently, CRO staff work to ensure that all analysts participating in the review have the appropriate system access and are adequately trained in the software and review processes.

3.3.2   Conduct Decennial Response File (DRF-2) Review [23-3.2]

The "Conduct Decennial Response File (DRF-2) Review" operational subactivity is subdivided into the following activities.

- Review DRF-2 [23-3.2.1].
- Resolve DRF-2 Findings [23-3.2.2].

A view of the activities that make up the "Conduct Decennial Response File (DRF-2) Review" operational subactivity appears in Figure 13 below.
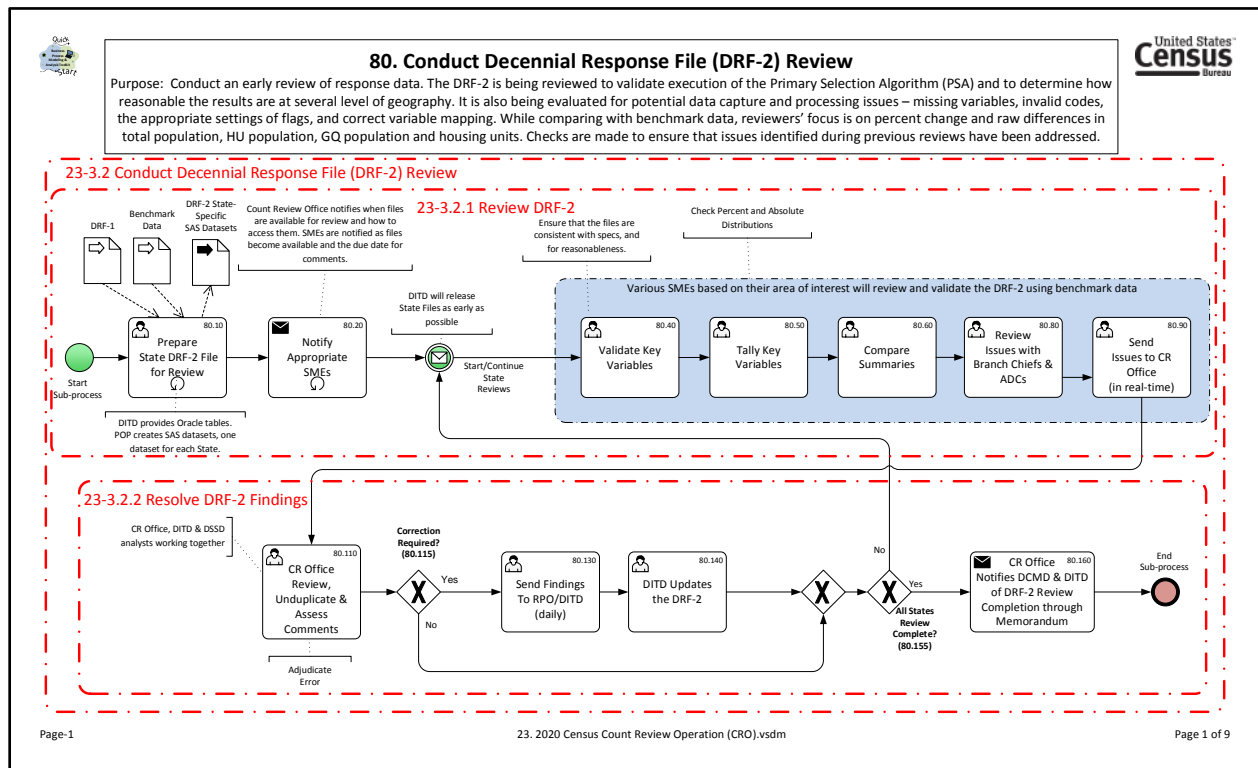
Figure 13: Conduct Decennial Response File (DRF-2) Review [23-3.2]

The review of the DRF-2 provides an early look at the response data. The review consists largely of comparisons between the 2020 Census counts of people and housing units at the state, county, and tract levels and several benchmark data sources, with the intent of identifying any results that are outside of reasonable parameters.

The Decennial Response File 1 (DRF-1) consists of all collected response data, sorted by living quarters. The DRF-2 is the result of implementing the Primary Selection Algorithm (PSA) on the DRF-1, where a single response is selected to represent each housing unit. This single response may be the result of combining one or more responses. CRO analysts examine the DRF-2 at multiple levels of geography to ensure that the data are consistent with file specifications and appear demographically reasonable.

3.3.2.1 Review DRF-2 [23-3.2.1]

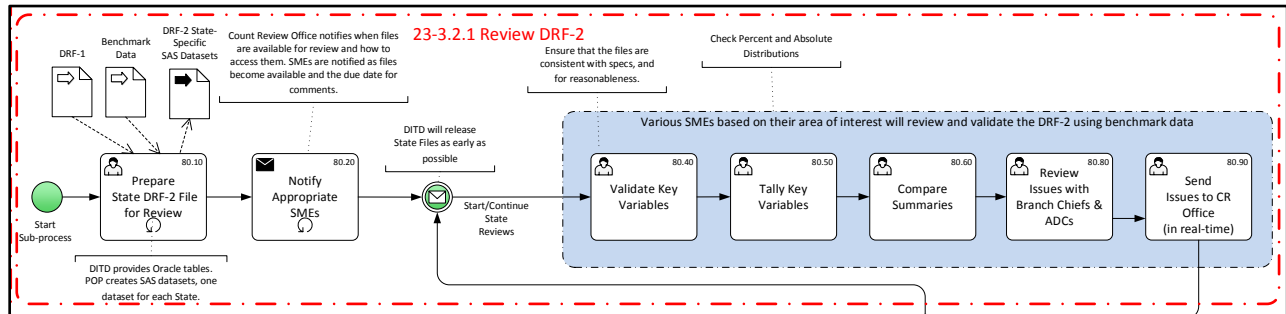Figure 14 below shows the work to Review DRF-2.

Figure 14: Review DRF-2 [23-3.2.1]

The DRF-2 review begins when POP receives the required inputs and uses them to generate the state-specific review files. The SMEs and general experts perform a number of checks to determine whether the data are consistent with the file specifications, and whether the results appear demographically reasonable. Any potential processing errors are identified and documented.

3.3.2.2 Resolve DRF-2 Findings [23-3.2.2]

Figure 15 below shows the work to Resolve DRF-2 Findings.

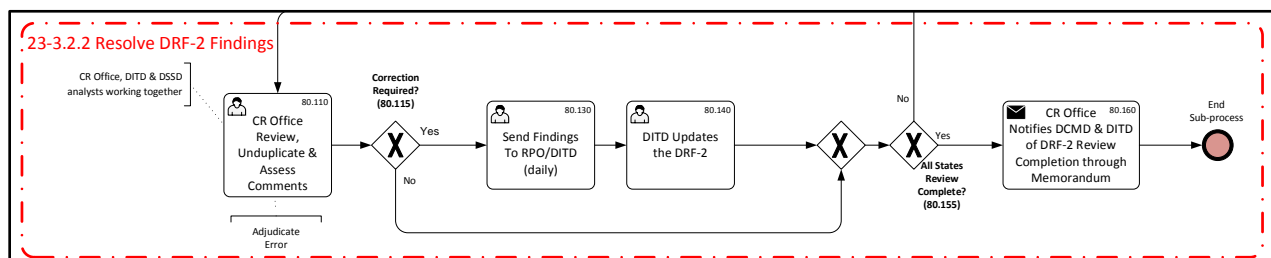**Figure 15: Resolve DRF-2 Findings [23-3.2.2]**

To resolve issues discovered in the review of the DRF-2, CRO coordinates with Decennial Statistical Studies Division (DSSD) and DITD. Findings from the CRO SMEs and general experts are assessed, adjudicated, and communicated on a daily basis to DITD. Then, when warranted, DITD updates the DRF-2, and the updated versions of the DRF-2 are sent back to CRO for re-review.

3.3.3 Conduct Census Unedited File (CUF) Review [23-3.3]

The "Conduct Census Unedited File (CUF) Review" operational subactivity is subdivided into the following groups of activities.

- Review CUF [23-3.3.1].
- Resolve CUF Findings [23-3.3.2].

A view of the activities that make up the "Conduct Census Unedited File (CUF) Review [23-3.3]" operational subactivity appears in Figure 16 below.
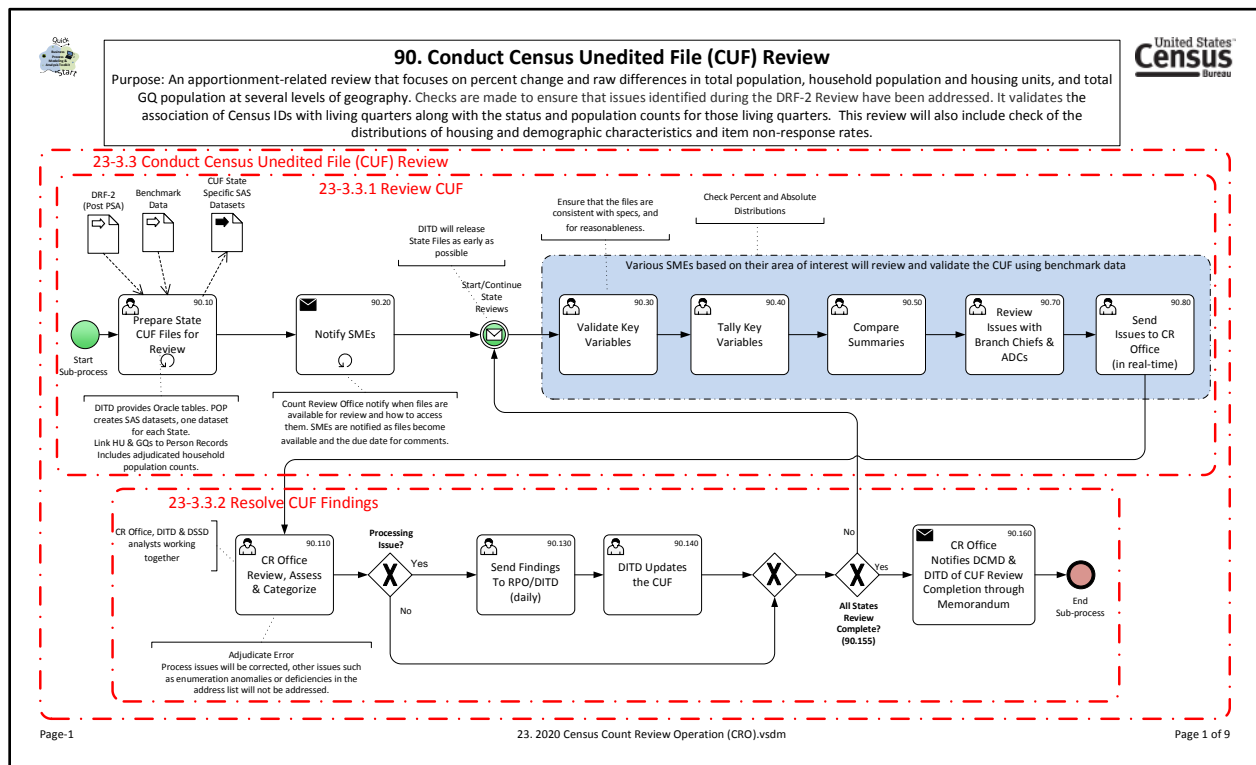
Figure 16: Conduct Census Unedited File (CUF) Review [23-3.3]

The CUF provides the final census count of people and living quarters. It is created by the application of the Preliminary Census Unedited File (PCUF) and Count Imputation (CI) processes to the post-PSA DRF. Count imputation is only applied to housing units, as group quarters found to be vacant are not counted in the CUF. After applying the MAF ID State Change (MISC) File to the CUF, the resulting state population totals, as well as the state population totals from the Federally Affiliated Count Overseas (FACO) File, are the basis for apportionment. CRO

analysts examine the CUF at multiple levels of geography to ensure that the data are consistent with file specifications and appear demographically reasonable.

3.3.3.1   Review CUF [23-3.3.1]

Figure 17 below shows the work to Review CUF.

Figure 17: Review CUF [23-3.3.1]

The CUF review begins when POP receives the required inputs and uses them to generate the state-specific review files. The SMEs and general experts perform a number of checks to determine whether the data are consistent with the file specifications, and whether the results appear demographically reasonable. Any potential processing errors are identified and documented.

3.3.3.2   Resolve CUF Findings [23-3.3.2]

Figure 18 below shows the work to Resolve CUF Findings.
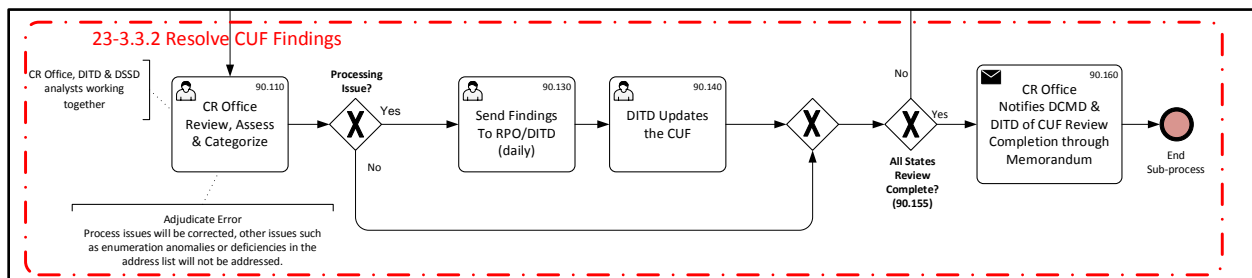
Figure 18: Resolve CUF Findings [23-3.3.2]

To resolve issues discovered in the review of the CUF, CRO coordinates with DSSD and DITD. Findings from the CRO SMEs and general experts are assessed, adjudicated, and communicated

on a daily basis to DITD. Then, when warranted, DITD updates the CUF and the updated versions of the CUF are sent back to CRO for re-review.

3.3.4 Conduct Census Edited File (CEF) Review [23-3.4]

The "Conduct Census Edited File (CEF) Review" operational subactivity is subdivided into the following groups of activities:

- Review CEF [23-3.4.1].
- Resolve CEF Findings [23-3.4.2].

A view of the activities that make up the "Conduct Census Edited File (CEF) Review" operational subactivity appears in Figure 19 below.
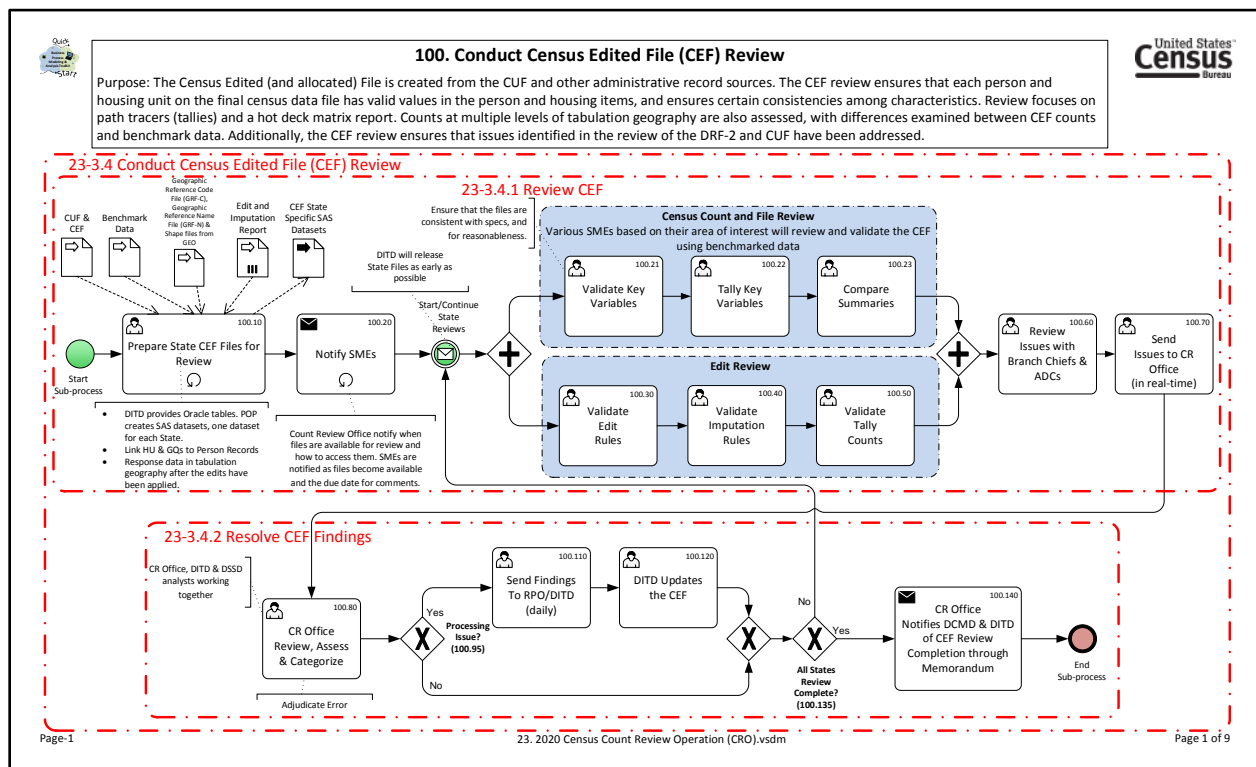
Figure 19: Conduct Census Edited File (CEF) Review [23-3.4]

The CEF is created by implementing Edit and Characteristics Imputations on the CUF. The objective of the substitution, pre-edit, and main edit and allocation processes ensures that each record in the CEF is filled with a valid value for the following items: group quarters type (including a status of not a group quarters), tenure, detailed vacancy status, relationships to householder, sex, age, date of birth, Hispanic origin, and race. CRO analysts examine the CEF at

multiple levels of geography to ensure that the data are consistent with file specifications, that edits have been properly applied, and that the data appear demographically reasonable.

3.3.4.1   Review CEF [23-3.4.1]

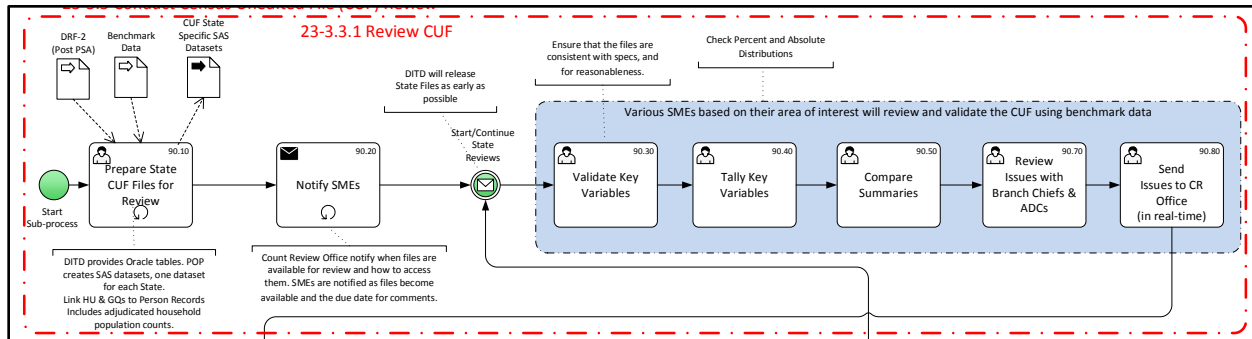Figure 20 below shows the work to Review CEF.

Figure 20: Review CEF [23-3.4.1]

The CEF review begins when POP receives the required inputs and uses them to generate the state-specific review files. The SMEs and general experts perform a number of checks to determine whether the data are consistent with the file specifications, and whether the results appear demographically reasonable. Any potential processing errors are identified and documented.

3.3.4.2   Resolve CEF Findings [23-3.4.2]

Figure 21 below shows the work to Resolve CEF Findings.
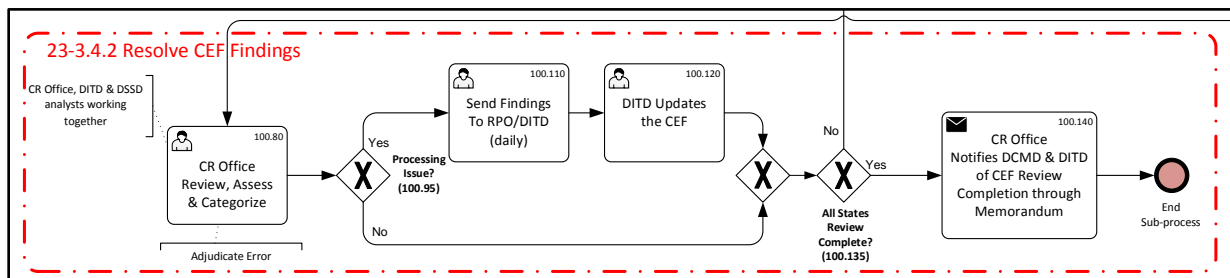
Figure 21: Resolve CEF Findings [23-3.4.2]

To resolve issues discovered in the review of the CEF, CRO coordinates with DSSD and DITD. Findings from the CRO SMEs and General Experts are assessed, adjudicated, and communicated

on a daily basis to DITD. Then, when warranted, DITD updates the CEF and the updated versions
of the CEF are sent back to CRO for re-review.

3.3.5   Conduct Microdata Detail File (MDF) Review [23-3.5]

The "Conduct Microdata Detail File (MDF) Review" operational subactivity is subdivided into
the following groups of activities.

- Review MDF [23-3.5.1].
- Communicate MDF Findings [23-3.5.2].

A view of the activities that make up the "Conduct Microdata Detail File (MDF) Review"
operational subactivity appears in Figure 22 below.
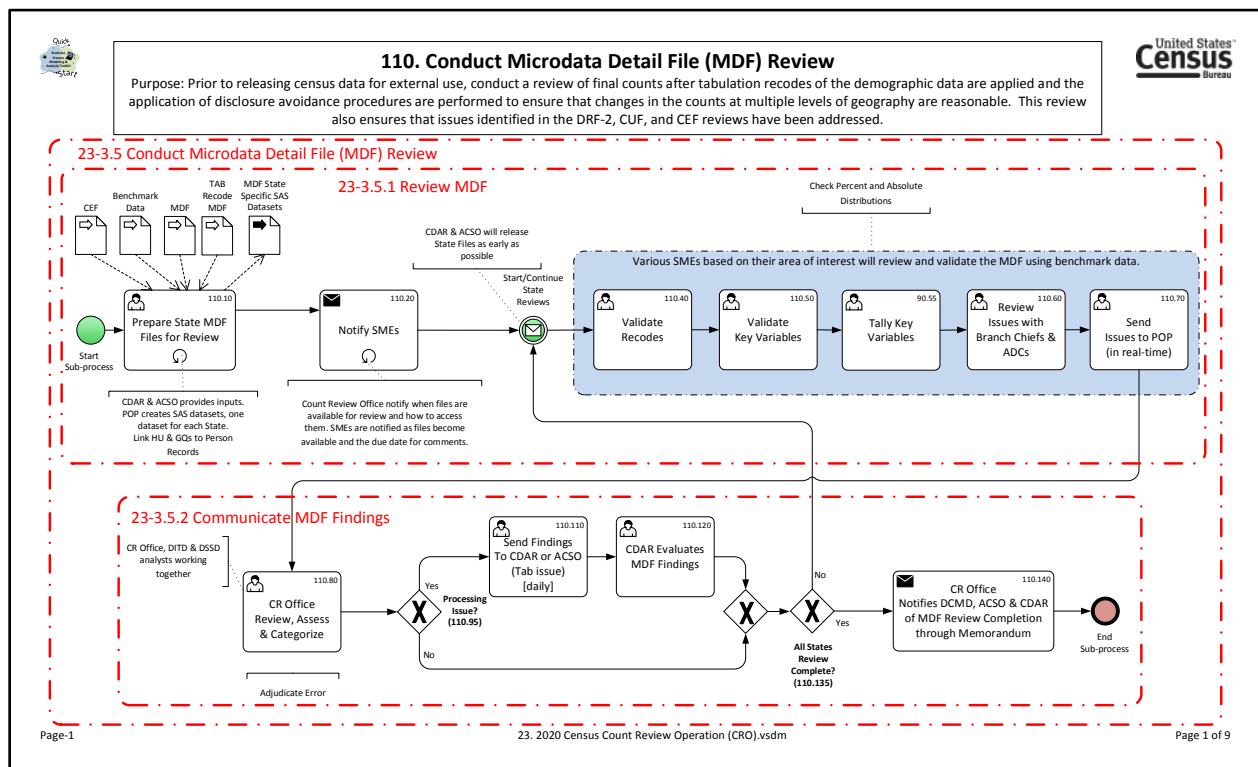
Figure 22: Conduct Microdata Detail File (MDF) Review [23-3.5]

The MDF is the file used as the input for tabulation and data dissemination. CRO analysts
examine the MDF at multiple levels of geography to ensure that the data are consistent with
file specifications and appear demographically reasonable.

3.3.5.1 Review MDF [23-3.5.1]

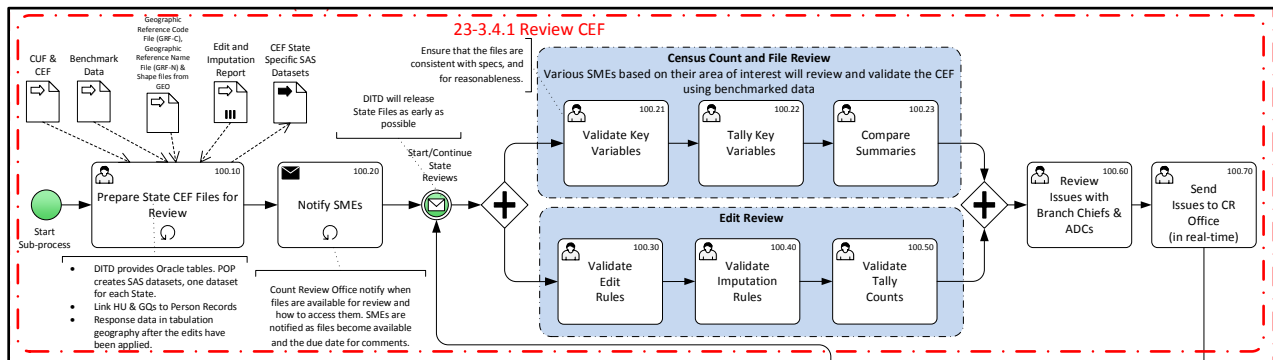Figure 23 below shows the work to Review MDF.
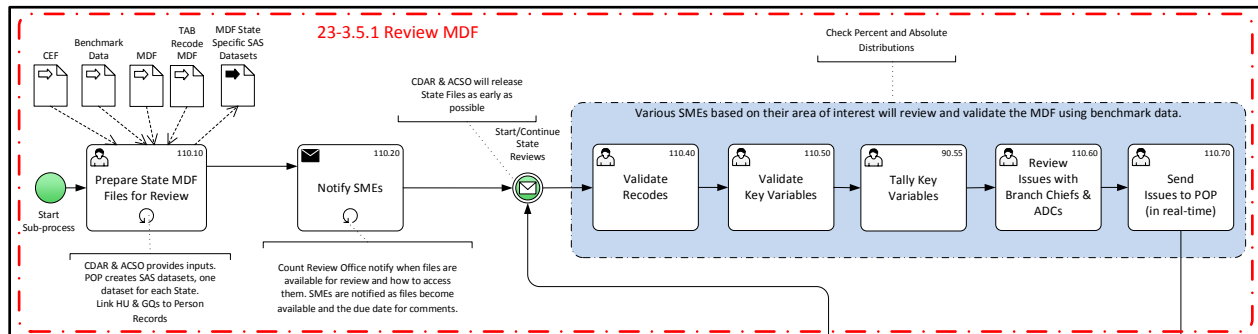
Figure 23: Review MDF [23-3.5.1]

The MDF review begins when POP receives the required inputs and uses them to generate the state-specific review files. The SMEs and general experts perform a number of checks to determine whether the data are consistent with the file specifications, and whether the results appear demographically reasonable. Any potential processing errors are identified and documented.

3.3.5.2 Communicate MDF Findings [23-3.5.2]

Figure 24 below shows the work to Communicate MDF Findings.
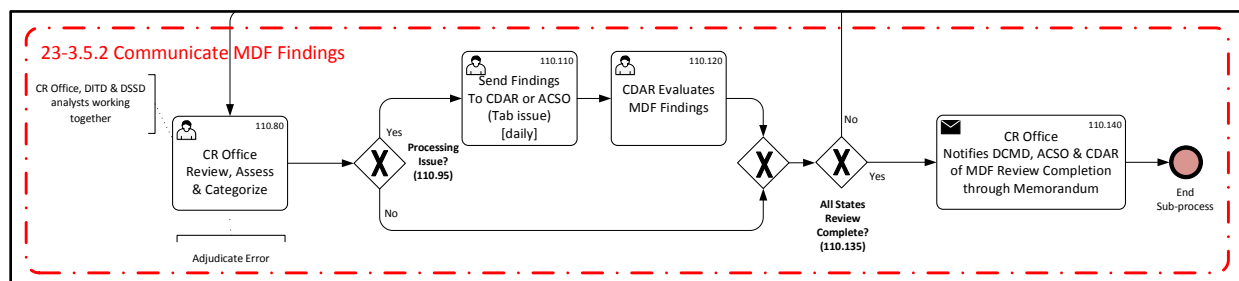
Figure 24: Communicate MDF Findings [23-3.5.2]

To communicate potential issues discovered in the review of the MDF, CRO coordinates with DSSD and DITD. Findings from the CRO SMEs and general experts are assessed and adjudicated. If issues are deemed significant, they are communicated on a daily basis to CED or ACSO, who will evaluate the findings.

3.4 CRO Closeout [23-4]

Figure 25 below shows the BPM for the CRO Closeout [23-4] activity area (area within the gray rounded rectangle) and its constituent activities within the overall context of the CRO context model.
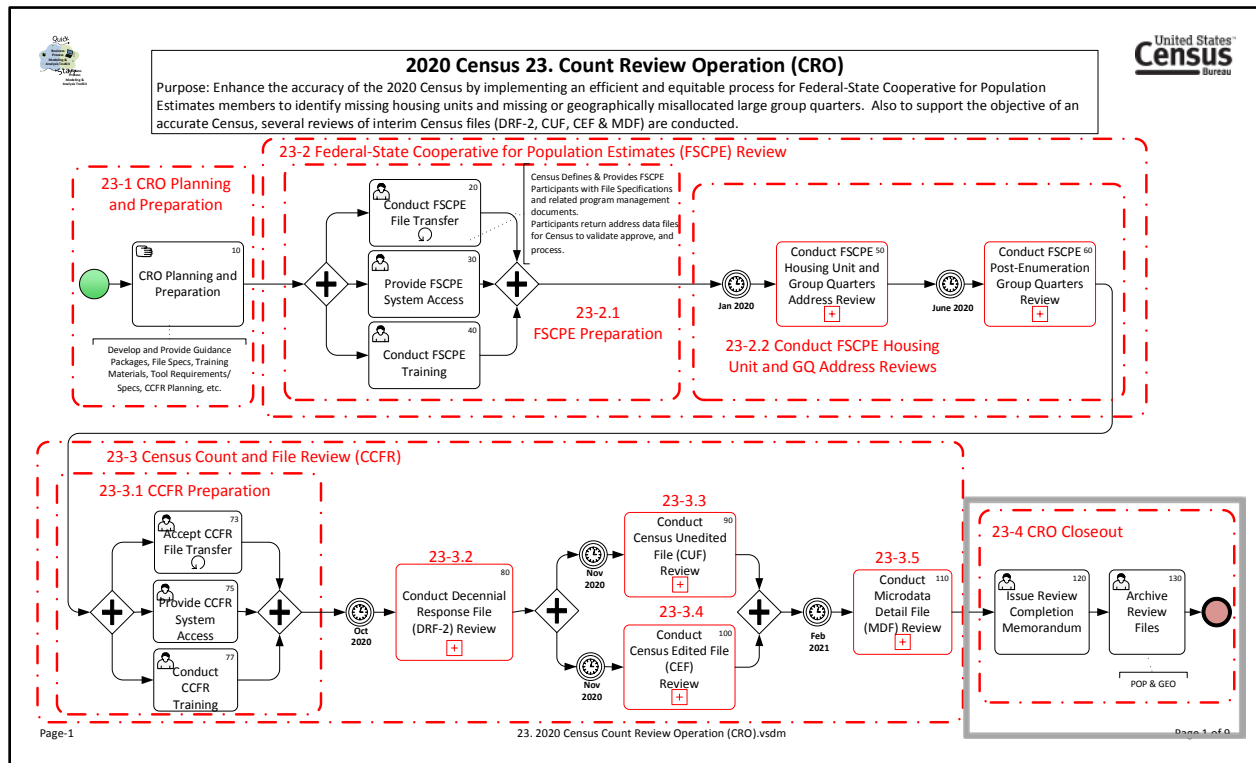
Figure 25: CRO Closeout [23-4]

Upon completion of the reviews of the DRF-2, CUF, CEF, and MDF, POP will issue a Review Completion Memorandum summarizing findings from the review. Separate documentation summarizing the results from the FSCPE reviews will also be prepared. Review files will then be archived according to the Census Bureau standards.

4. Cost Factors

While CRO is not a major cost driver for the 2020 Census, the following mechanisms from the IDEF0 Context Diagram represent the resources used to support this operation and comprise part of the 2020 Census cost elements:

Staff

- Headquarters (HQ) staff.
- FSCPE members.

Sites

- HQ.

Systems

- MAF/TIGER.
- GUPS.
- CRAVA.
- ECaSE-OCS.
- ECaSE-Field OCS.
- UTS.
- GQPCS.
- CRO-PCS.
- DRPS.
- DRPS: DAS.
- ACSO Tabulation system.
- Census Data Lake (CDL).

Other

- HQ Office Information Technology (IT) Infrastructure.
- Census Networks.

5. Measures of Success

For the 2020 Census operations, the corresponding Measures of Success will be documented in the operational assessment study plans and final reports. The operational assessment study plan documents the criteria that will be used to define successful completion of the operation. The operational assessment report will provide results on whether the criteria were met.

In general, operational assessments report on planned to actual variances in budget, schedules, and production and training workloads. The corresponding Measures of Success (as documented in the operational assessment study plan) include variances that exceed established thresholds. See *Preparing for the 2020 Census Operational Assessment Study Plan* for the potential scope of assessment.

Types of success measures include:

- **Process Measures** that indicate how well the process works, typically including measures related to completion dates, rates, and productivity rates.
- **Cost Measures** that drive the cost of the operation and comparisons of actual costs to planned budgets. Costs can include workload as well as different types of resource costs.
- **Measures of the Quality** of the results of the operation, typically including things such as rework rates, error rates, and coverage rates.

See the corresponding operational assessment study plan and report for the Count Review Operation (CRO) for details on the measures of success.

Appendix A – Acronyms and Terminology

Table 7 lists the acronyms and abbreviations used within this Detailed Operational Plan document.

Table 8 lists a Glossary of Terms used within this Detailed Operational Plan document.

Additional Decennial terminology can be found on the Census Bureau Intranet.

Table 7: Acronyms and Abbreviations List

Acronym	Meaning
ACO	Area Census Office
ACS	American Community Survey
ACSO	American Community Survey Office
ADC	Address Canvassing operation
ADC	Assistant Division Chief
AdRec	Administrative Records
ARC	Archiving operation
BCU	Basic Collection Unit
BPM	Business Process Model
BPMN	Business Process Model and Notation
CCFR	Census Count and File Review
CDL	Census Data Lake
CED	Center for Enterprise Dissemination
CEF	Census Edited File
CI	Coverage Improvement

Acronym	Meaning
CQA	Census Questionnaire Assistance operation
CRAVA	Census Review, Analysis, and Visualization Application
CRO	Count Review Operation
CRO-PCS	Processing Control System for Count Review Operation
CSV	Comma Separated Value
CUF	Census Unedited File
DAS	Disclosure Avoidance System
DITD	Decennial Information Technology Division
DLM	Decennial Logistics Management operation
DOP	Detailed Operational Plan
DPD	Data Products and Dissemination operation
DRF	Decennial Response File
DRPS	Decennial Response Processing System
DSC	Decennial Service Center operation
DSF	Delivery Sequence File
DSSD	Decennial Statistical Studies Division
EAE	Evaluations and Experiments operation
ECaSE	Enterprise Censuses and Surveys Enabling
ECaSE-OCS	Enterprise Censuses and Surveys Enabling-Operational Control System
ETL	Enumeration at Transitory Locations operation
FACO	Federally Affiliated Count Overseas operation

Acronym	Meaning
FEUC	Follow-up Enumeration Universe Control File
FLDI	Field Infrastructure operation
FPD	Forms Printing and Distribution operation
FSCPE	Federal-State Cooperative for Population Estimates
FY	Fiscal Year
GDP	Geographic Data Processing
GEO	Geography Division
GEOP	Geographic Programs operation
GEOP/GP	Geographic Programs (GEOP) Geographic Partnership Component
GIS	Geographic Information System
GQ	Group Quarters
GQ	Group Quarters operation
GQE	Group Quarters Enumeration
GQPCS	Production Control System from GQ
GQAC	Group Quarters Advance Contact
GSS	Geographic Support System
GUPS	Geographic Update Partnership Software
HDF	Hundred Percent Detail File
HQ	Headquarters
HU	Housing unit
IA	Island areas

Acronym	Meaning
IAC	Island Areas Censuses operation
IA-CEF	Island Areas Census Edited File
IA-CUF	Island Areas Census Unedited File
IA-MDF	Island Areas Microdata Detail File
IDEF0	Integrated Definition, Level 0
IE	Information Exchange
IOD	Integrated Operations Diagram
IPT	Integrated Project Team
ISR	Internet Self-Response operation
IT	Information Technology
ITIN	IT Infrastructure operation
LUCA	Local Update of Census Addresses operation
MAF	Master Address File
MAFCS	Master Address File Coverage Study
MAF/TIGER	Master Address File/Topologically Integrated Geographic Encoding and Referencing system
MAS	Master Activity Schedule
MDF	Microdata Detail File
NARA	National Archives and Records Administration
NC	New Construction
NID	Non-ID Processing operation
NRFU	Nonresponse Followup operation

Acronym	Meaning
OCS	Operational Control System
OMB	Office of Management and Budget
PCUF	Preliminary Census Unedited File
PDC	Paper Data Capture operation
PM	Program Management operation
POP	Population Division
PR	Puerto Rico
PSA	Primary Selection Algorithm
QC	Quality Control
QGIS	Quantum GIS (open source GIS software)
RDP	Redistricting Data Program
RI	Reinterview
RPO	Response Processing Operation
SMEs	Subject matter experts
SPC	Security, Privacy, and Confidentiality operation
SR	Self-Response
TCR	Traditional Count Review
TEA	Type of Enumeration Area
UE	Update Enumerate operation
UL	Update Leave operation
USPS	United States Postal Service

Acronym	Meaning
UTS	Unified Tracking System
VDI	Virtual Desktop Infrastructure

Table 8: Glossary of Terms

Term	Meaning
Apportionment	After each decennial census, the population count of the United States and overseas military and civilian dependents is used to calculate the number of members of the U.S. House of Representatives beyond the one per state to which each state is entitled. With 435 members of Congress, this effort disperses the remaining 385 representatives based on the method of equal proportions. The method of equal proportions is applied to the population totals for states (and overseas military) and does not include Puerto Rico, the Island Areas, or the District of Columbia.
City-Style Address	An address that consists of a house number and street or road name, for example, 101 Main Street.
College/University Student Housing	Includes residence halls and dormitories, which house college and university students in a group living arrangement. These facilities are owned, leased, or managed either by a college, university, or seminary, or by a private entity or organization. Fraternity and sorority housing recognized by the college or university are included as college student housing.
Correctional Residential Facilities	These are community-based facilities operated for correctional purposes. The facility residents may be allowed extensive contact with the community, such as for employment or attending school, but are obligated to occupy the premises at night. Examples are halfway houses, restitution centers, and prerelease, work release, and study centers.

Term	Meaning
Coverage Error	A measurement of census data quality. Coverage error can occur because of 1) the failure to include in a census or survey all eligible individuals or housing units (undercoverage), or 2) the inclusion of some individuals or housing units erroneously (overcoverage). Includes living quarter or person omissions, erroneous enumerations (including duplicates), correct enumerations, and whole-person census imputations, or some subcategories of these components. Undercoverage is the most serious type of coverage error because it can be difficult to detect and even more difficult to solve.
Federal Detention Centers	Stand alone, generally multilevel, federally operated correctional facilities that provide "short-term" confinement or custody of adults pending adjudication or sentencing. These facilities may hold pretrial detainees, holdovers, sentenced offenders, and Immigration and Customs Enforcement (ICE) inmates, formerly called Immigration and Naturalization Service (INS) inmates. These facilities include: Metropolitan Correctional Centers (MCCs), Metropolitan Detention Centers (MDCs), Federal Detention Centers (FDCs), Bureau of Indian Affairs Detention Centers, ICE Service Processing Centers, and ICE contract detention facilities.
Federal Prisons and State Prisons	Adult correctional facilities where people convicted of crimes serve their sentences. Common names include prison, penitentiary, correctional institution, federal or state correctional facility, and conservation camp. The prisons are classified by two types of control: (1) "federal" (operated by or for the Bureau of Prisons of the Department of Justice) and (2) "state." Residents who are forensic patients or criminally insane are classified on the basis of where they resided at the time of enumeration. Patients in hospitals (units, wings, or floors) operated by or for federal or correctional authorities are counted in the prison population. Other forensic patients will be enumerated in psychiatric hospital units and floors for long-term nonacute patients. This category may include privately operated correctional facilities.

Term	Meaning
Group Quarters	Group quarters are places where people live or stay in a group living arrangement, which is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other.
Housing Unit	A house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as a separate living quarters. A housing unit must have direct access from the outside or through a common hall.
Living Quarters	A place where people either live or stay or could live or stay and are classified as either a housing unit or group quarters. Living quarters may be occupied or vacant.
Local Jails and Other Municipal Confinement Facilities	Correctional facilities operated by or for counties, cities, and American Indian and Alaska Native tribal governments. These facilities hold adults detained pending adjudication or people committed after adjudication. This category also includes work farms and camps used to hold people awaiting trial or serving time on relatively short sentences. Residents who are forensic patients or criminally insane are classified on the basis of where they resided at the time of enumeration. Patients in hospitals (units, wings, or floors) operated by or for local correctional authorities are counted in the jail population. Other forensic patients will be enumerated in psychiatric hospital units and floors for long-term non-acute patients. This category may include privately operated correctional facilities.
Loss Function	A statistical index value showing the magnitude of difference, considering both numeric and percentage differences.

Term	Meaning
Military Quarters	These facilities include military personnel living in barracks (including "open" barrack transient quarters) and dormitories and military ships. Patients assigned to Military Treatment Facilities and people being held in military disciplinary barracks and jails are not enumerated in this category. Patients in Military Treatment Facilities with no usual home elsewhere are not enumerated in this category.
Non-city-style address	A non-city-style mailing address is one that uses a rural route and box number format or a post office (PO) box format. Examples of these types of addresses are RR 2, Box 9999, Anytown, ST 99988 and PO Box 123, Anytown, ST 99988.
Nursing Facilities/Skilled-Nursing Facilities	Includes facilities licensed to provide medical care with seven day, 24-hour coverage for people requiring long-term nonacute care. People in these facilities require nursing care, regardless of age. Either of these types of facilities may be referred to as nursing homes.
Processing Error	Processing error can occur during the preparation of the final data files. For example, errors may occur if data entry of questionnaire information is incomplete or inaccurate. Coding of responses incorrectly also results in processing error. Critical reviews of edits and tabulations by subject matter experts are conducted to keep errors of this kind to a minimum.
Special Sworn Status	The Census Bureau gives Special Sworn Status (SSS) to individuals to conduct work that specifically benefits a Census Bureau program. SSS individuals are sworn for life to protect the data as Census Bureau employees are sworn, and they are subject to the same legal obligations and penalties.

Term	Meaning
Workers' Group Living Quarters and Job Corps Centers	Includes facilities such as dormitories, bunkhouses, and similar types of group living arrangements for agricultural and nonagricultural workers. This category also includes facilities that provide a full-time, year-round residential program offering a vocational training and employment program that helps young people 16-to-24 years old learn a trade, earn a high school diploma or GED and get help finding a job. Examples are group living quarters at migratory farm worker camps, construction workers' camps, Job Corps centers and vocational training facilities

Appendix B – References

Appendix B lists the documents or other resources used during the development of this Detailed Operational Plan document.

Byerly, Edwin R (2012), "2010 Census Count Review Program Assessment Report," 2010 Census Planning Memo No. 203.

U.S. Census Bureau (2019), "2020 Census Operational Plan," Version 4.0, February 1, 2019.

U.S. Census Bureau, *Preparing for the 2020 Census Operational Assessments Study Plan.*

Appendix C – Activity Tree for Count Review (CRO)

This appendix presents the Activity Tree for the CRO operation. An Activity Tree uses an outline structure to reflect the decomposition of the major operational activities in the operation. Each activity is numbered according to its position in the outline. For example, for the current operation numbered "23," the first activity would be numbered 23-1. Subactivities under this activity would be numbered sequentially, starting again with the number one. For example, the first subactivity under the first activity would be numbered 23-1.1 the second subactivity as 23-1.2. The second activity would be numbered 23-2, and so on.

CRO Activity Tree:

- 23-1 CRO Planning and Preparation
- 23-2 Federal-State Cooperative for Population Estimates (FSCPE) Review
    - o 23-2.1 FSCPE Preparation
    - o 23-2.2 Conduct FSCPE Housing Unit and GQ Address Reviews
        - ▪ 23-2.2.1 Conduct FSCPE Housing Unit and Group Quarters Address Review
        - ▪ 23-2.2.2 Conduct Post-Enumeration Group Quarters Review
- 23-3 Census Count and File Review (CCFR)
    - o 23-3.1 CCFR Preparation (BPM 71-77)
    - o 23-3.2 Conduct Decennial Response File (DRF-2) Review
        - ▪ 23-3.2.1 Review DRF-2
        - ▪ 23-3.2.2 Resolve DRF-2 Findings
    - o 23-3.3 Conduct Census Unedited File (CUF) Review
        - ▪ 23-3.3.1 Review CUF
        - ▪ 23-3.3.2 Resolve CUF Findings
    - o 23-3.4 Conduct Census Edited File (CEF) Review
        - ▪ 23-3.4.1 Review CEF
        - ▪ 23-3.4.2 Resolve CEF Findings
    - o 23-3.5 Conduct Microdata Detail File (MDF) Review
        - ▪ 23-3.5.1 Review MDF
        - ▪ 23-3.5.2 Communicate MDF Findings
- 23-4 CRO Closeout